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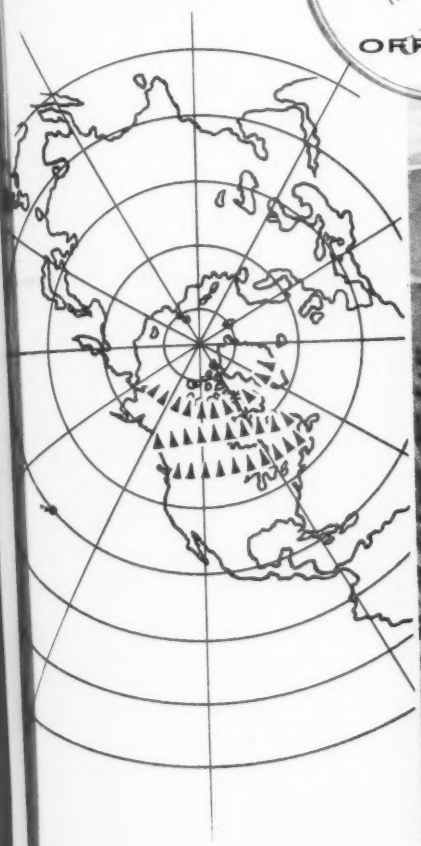

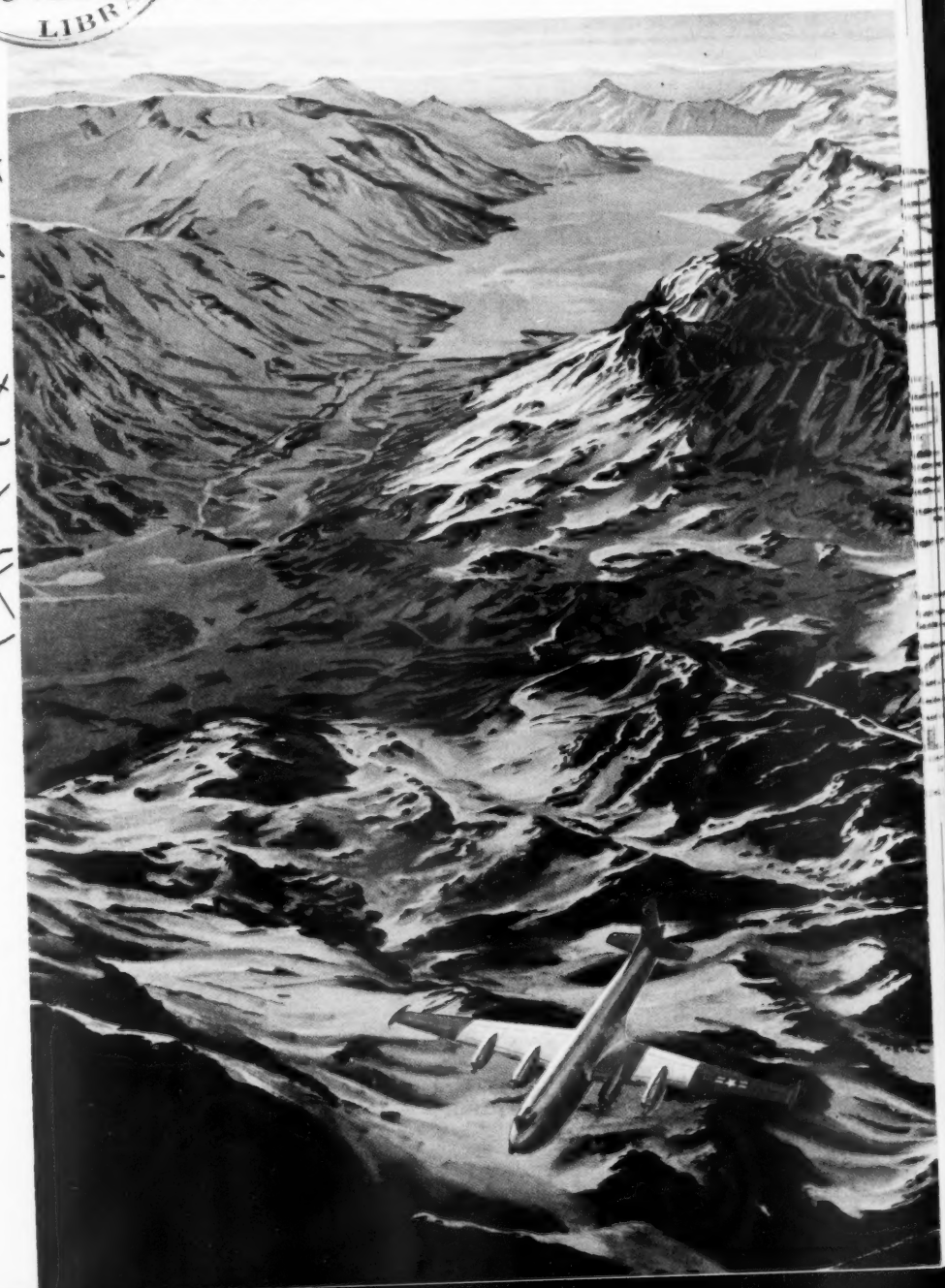

General White discusses Deterrence — page 2

Pete Quesada writes about FAA — page 4

USAF in the Arctic — page 42

The Parabolic Antenna

...Space Age Symbol

Workmen are almost lost in the spiderweb maze of the parabolic antenna they are assembling. This is a BMEWS missile tracker, built for the Air Force by the Goodyear Aircraft Corporation. This month THE AIRMAN has three stories highlighting some of the roles the parabolic-shaped antenna plays in the dawning age of space. For one part of its defense function, see *The Air Force's Polar Push*, page 42. For its role in safer air traffic control, see *FAA Looks to the Future*, page 4. And finally, to learn how it was developed and is being used in space exploration, read *The Sounding Firmament*, page 15.

Photo courtesy Goodyear Aircraft Corp.

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Volume IV, Number 5 May 1960

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Use of funds for printing this publication approved by the Secretary of the Air Force and the Director of the Bureau of the Budget June 9, 1959.

LETTERS TO THE EDITOR

REUNION

Sir: Efforts are being made to organize a reunion for WW II members of the 390th Bomb Group. I would appreciate any interested persons contacting me at Detachment 5, Hq, 26th Air Division, this base.

Col. Robert W. Waltz
Stewart AFB, N. Y.

★ ★ ★

FLYING HOURS

Sir: With regard to the question raised by Sergeant Segatti in the February *Letters to the Editor* column, I readily recall numerous cases wherein MATS C-54 aircraft have repeatedly logged more than 300 hours per month. This proved to be especially true during the Korean campaign with the aircraft flown and maintained by the 1500th Air Transport Group at Hickam AFB, Hawaii.

Maj. J. E. Muldoon
Wright-Patterson AFB, Ohio

Sir: I was a crew member for a C-54 aircraft assigned to the 1261st Air Transport Squadron, Wheelus Field, Tripoli, in 1949 when that aircraft logged 310 hours during a single month. It averaged nearly 11 hours daily during 28 flying days and was only out of commission a total of 186 hours and 30 minutes during the entire month.

MSgt. Robert Mitchell
Westchester County Airport, N. Y.

Sir: In 1958, I was witness to such a performance by a T-33 aircraft assigned to the 31st Air Division, Snelling AFS, Minn. During the month of April, this T-bird logged a total of 333 hours.

A/2C Nelson Vachereau
Pease AFB, N. H.

● *The question was whether anyone had knowledge of an Air Force aircraft which had exceeded 300 flying hours in any one month under normally assigned conditions.*

(Continued on page 30)

★ ★ ★

FRONT COVER

Approaching Sondrestrom AB, Greenland. Painting by Ken Fagg, member Society of Illustrators.

this Question of Deterrence

Because of the contemporary military significance of the term deterrence, resultant widespread usage has evolved varied interpretations of its true definition. The word, in fact, can have several literal meanings, depending on its employment. Therefore, in recent testimony before the Subcommittee on Appropriations, 86th Congress, General Thomas D. White considered it necessary to insert in the record a summary statement to, as he said in his prefacing remarks, ". . . assure the clarity of my comments concerning the Air Force's position on the subject of deterrence. . . ."

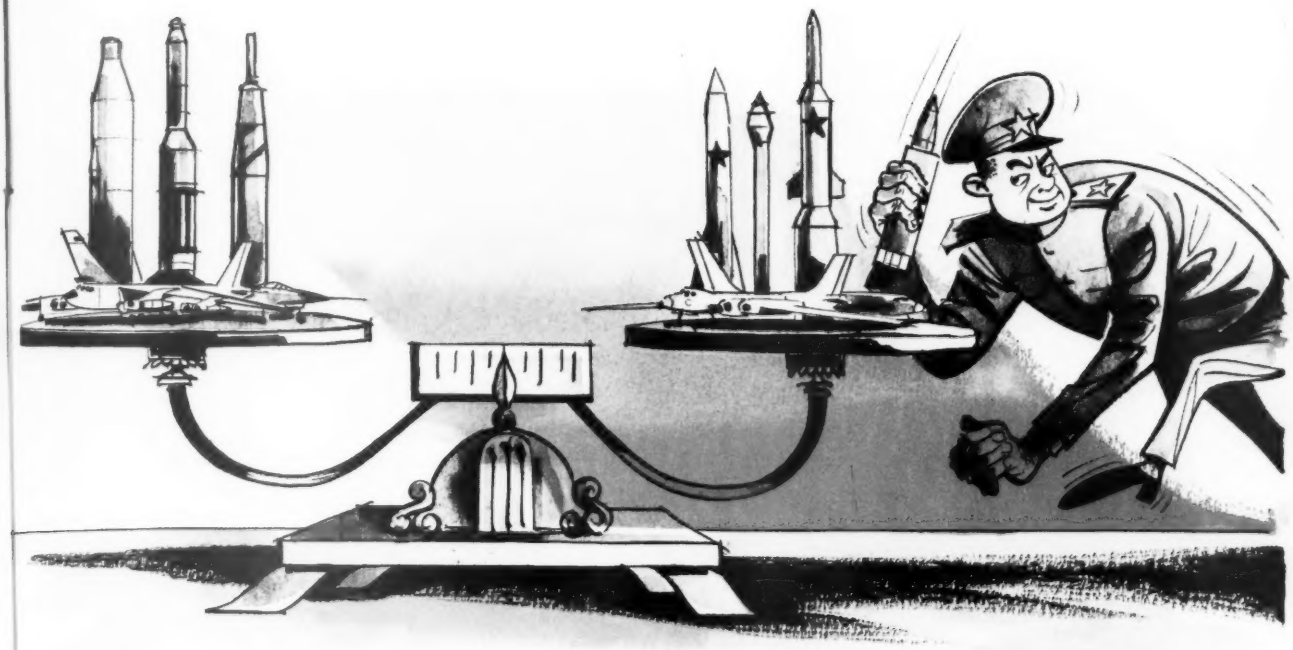
His ensuing statement constitutes an objective definition of deterrence and Aerospace Power's role in its achievement. All Air Force members should thoroughly understand this cornerstone of national policy.—THE EDITORS.

DETERRENCE of a strategic attack against us has become an increasingly discussed subject, and there is broad agreement on the need for effective deterrence. We hear today of all kinds of deterrence—mutual deterrence, finite deterrence, balanced deterrence, and stable deterrence. All of these terms reflect various theories, and they are a healthy sign of a deep national interest in the national problem of first importance.

Fundamentally, deterrence is what we hope to achieve through specific impact on the collective mind of the Soviet leadership. We achieve this impact as a result of their analysis of our total force posture, the capabilities they ascribe to that posture, and the options they think we have open to us. We must never lose sight of the fact that what we have in terms of military strength and what we can do with that strength is subject to cold, calculated analysis by the potential enemy. A significant change in military posture, a modification in essential capabilities does not and cannot remain a secret for long. Based on what they—the Soviet leadership—conclude about our manifest strength is the assessment which we hope will continue to result in deterrence.

I mentioned mutual deterrence. I take particular exception to this term because of its suggestion that we, the United States, are being deterred from a deliberate attack on the Soviet Union. I reject this—as I am sure you do. I cannot agree that the Soviet Union is trying to deter us. Deterrence, as I see it, is a one-sided problem—it is ours.

From mutual deterrence it is one quick step to finite deterrence. This theory, based upon a limited or minimal strategic capability, seems first to disregard the possibility of reaction on our part to strategic warning, and this in itself is, in my judgement, so critical a deficiency as to invalidate the theory. This theory would have us base our defense on having enough forces surviving after an attack to destroy 100 or so enemy cities. The thought seems to be that this city destruction capability—without a specifically developed capability to



destroy enemy aerospace forces—would be enough to deter the enemy. This is, I believe, an extremely dangerous approach to the problem. In the first place we are obligated to minimize the damage on the United States under any circumstances.

Consider also the impact of this concept on broad national policy objectives. Suppose that we concentrated on developing forces with a specific capability for city destruction instead of forces designed to destroy enemy nuclear delivery power. Then suppose the enemy decided to attack one of our allies to whom we have basic security obligations. Under these circumstances we would be forced to recognize that our decision to support the ally under attack could mean direct attack on our country by unimpaired Soviet striking power. I believe this situation would be apparent to the enemy and to our allies. It seems to me that "finite deterrence" equates pretty well with a "Fortress America" concept. I don't think that any such view of the problem is reasonable or acceptable.

This leads us into the next step along the line which involves so-called balanced or stable deterrence. I should make it clear at the outset that this question of achieving stability or of maintaining balance is a very tough one. We are dealing with two military systems which, as far as human knowledge today goes, represent close to the infinite in complication. Each system is composed of numerous critical elements. To suggest that we can count on achieving and maintaining a balance or a stability in all of the elements or even all of the key elements of this complicated structure is, in my judgment, not much more than unsupportable hopefulness. Tactics of offense and defense, scientific breakthrough, weapon development, passive defensive measures, all play upon one another in offering new ways to upset this balance, this stability. I find no comfort in any thought that the Soviets are not doing all that is within their power to assure this upset—in their favor.

I think that deterrence is too comprehensive a problem to be refined as far and as finitely as some would have us do. I would agree that all of this thinking, all of this discussion is helpful even if it only serves to highlight fallacies. What I would hope is that in the national interest we will recognize the nature of the job we have on our hands; that we will appreciate that there is no easy, quick fix and that we will give it the continuous attention, thought, and effort that its importance to our national survival warrants.

In summary, my opinion is that the true deterrent posture which we must have is composed of:

(a) Carefully designed military forces sufficient in both quantity and quality to destroy the enemy's war-making capacity and will to fight.

(b) The national resolve and determination to maintain such military forces and to use them if necessary.

(c) Recognition by the potential enemy that this combination of strength and determination exist and are credible.

FAA Looks to the Future

by Elwood R. (Pete) Quesada

Administrator, Federal Aviation Agency

EVERYONE who is associated in any way with aviation is aware of the tremendous problems which have arisen as a result of its phenomenal growth. Airspace—once regarded as an unlimited immensity—has become crowded to the point of saturation over an unbelievably brief span of years and the accompanying threat of strangulation is looming as a formidable obstacle to further expansion.

The intensity of pressure on our air traffic control system and air navigation facilities poses a challenge of massive proportions—but our position is far from hopeless. I predict that as we harvest the fruit of present-day planning it will be possible for aircraft to proceed from Point A to Point B without regard for the existing airways structure.

But before discussing the future of aviation, let's look back for a moment. The key to aviation's future can be found in its past.

One of the great handicaps facing aviation in its earliest days was lack of recognition for its potentialities. Other earlier forms of mechanized transportation made their entrance on the social and economic scene much more sedately and in an atmosphere a good deal less turbulent. Both the railroad and the automobile developed from birth to maturity with relatively ordered precision under the stimulus of eager business competition and the obvious evidence of their usefulness. But many of us—both in and out of uniform—can remember the years when no orthodox requirement for a really efficient flying machine was generally recognized. Thus aviation, both military and civilian, grew up through a haphazard and uncertain childhood with very little parental guidance from society.

The possibilities of air transportation as a legitimate business with a promising future first began to emerge in the mid-1920s. The Air Commerce Act, passed in 1926, gave the Department of Commerce responsibility for regulating civil aviation. During the 1930s, in spite of the Great Depression, aviation grew by leaps and bounds. Both military and civilian branches benefited from improved aircraft performance; the concept of the "big bomber" was born; and industry began to demonstrate more and more confidence in the attributes of air transport.

The mileage covered by Federal civil airways increased rapidly from 2,041 miles in 1926 to 23,723 in 1938. In 1927 only 240 communities in the United States boasted municipal airports; by 1938 this number had mushroomed to 1,092. By this time it was evident that civil aviation had become a permanent factor in industry and a vital adjunct to National defense.

The Civil Aeronautics Act of 1938 created the Civil Aeronautics Administration and the Civil Aeronautics Board in an effort to consolidate the functions which

Air Force experience is contributing to FAA's driv

accrued over the years to the Post Office Department, the Interstate Commerce Commission, and the Bureau of Air Commerce. The CAA was assigned responsibility for enforcement of safety regulations, air traffic control, operation of airways, aviation communications, and improvement of airports. The board—CAB—was charged with writing the Civil Air Regulations, investigating accidents, and economic regulation of the industry. It was in this year 1938 that the Army Air Corps, faced with its share of problems in the areas of navigation, traffic control, and communications, organized what is now known as Airways and Air Communications Service (AACS).

Even before the advent of World War II it was already clear that the machinery established by CAA and CAB was inadequate to the ever-expanding task of regulating aviation. The war prevented any genuine overhaul of the system at that time. Later, with the restoration of peace, problems became even more acute as the industry embarked on a period of accelerated development.

From 1938 to 1956 the number of scheduled airlines grew from 22 to 53, domestic and international; the number of cities served from 286 to 695; the number of passengers annually from 1,536,000 to approximately 42,000,000; and the amount of cargo (mail, express, and freight) from 10 million to more than 484 million ton-miles. In military aviation the transition to jets imposed a 50 percent increase in airspace requirements.

As a result of all this, aviation reached a point where it was strangling on the inadequacies of a system intended to expedite traffic movement while promoting flight safety and general development. It appeared that airspace as a natural resource was exhausted by 1956.

A number of commissions appointed by the President and the Congress examined the problem at various times. The most recent of these investigations produced the Curtis Report which not only painted a gloomy picture of the situation at that time but pessimistically pointed to a worsening condition in the future unless something were done promptly.

"We have already passed the point in time," said the Curtis Report, "when our aviation facilities are capable of safely and efficiently handling all the aircraft seeking to fly. Our present manual system of air traffic control has been unable to efficiently absorb a growth in aircraft population . . . by patchwork improvements and short-term quick fixes."

During peak hours on busy days in 1956, the report continued, there were 175 aircraft simultaneously airborne in the New York area. "It is predicted that by 1975 this number will be 370." Equally startling statistics were cited for other high-density areas. Los Angeles, for example, with 270 aircraft simultaneously airborne today, will have 730 by 1975.

In substance, the recommendations contained in the Curtis Report called for the creation of the Federal

ELWOOD R. QUESADA

In 1924, Elwood R. Quesada was a buck private in the U. S. Army. When he retired from the Air Force in 1951 he wore the three stars of a lieutenant general. The story of his 27 years in uniform is diamond-studded with the drama, the daring, and the glamor which marked the salad days of American aviation.

In 1929 "Pete" Quesada was a crew member aboard the famed *Question Mark* which demonstrated the feasibility of aerial refueling by remaining aloft over Los Angeles for 151 hours. In 1933, when the Army was assigned to fly the air mail, Quesada was chief pilot on the New York to Cleveland run and personally made the flight on alternate nights.

As commander of the 9th Fighter Command in World War II, General Quesada directed the American aerial assault on the coast of France prior to invasion. So effective was this concentrated allied attack that the invading troops were enabled to land 16 divisions in five days. General Eisenhower viewed the invasion beaches and the battleground of the Norman hedgerow country from a seat in General Quesada's plane.

When Tactical Air Command was established in 1946 General Quesada became its first commander, and in 1949 assumed command of Joint Task Force Three which carried out Operation Greenhouse, a series of tests including the world's first detonation of a thermonuclear device.

Mr. Quesada was serving as Special Assistant to the President for Aviation when appointed to the post of Administrator of FAA in November 1959.

driveward safer, faster travel through our crowded skies.

Aviation Agency, an independent executive instrument consolidating all the essential management functions of civil aviation and those management functions common to military and civil aviation.

The preparation and passage of legislation took three months. We had planned on two and a half years. The vigorous and constructive testimony of the Under Secretary of the Air Force and the Vice Chief of Staff was instrumental in inspiring prompt and favorable action by the legislators. The Federal Aviation Act, passed on August 23, 1958, created the Federal Aviation Agency and repealed legislation dating back to 1926. FAA became operational on January 1, 1959.

Of particular interest to readers of THE AIRMAN is the military participation in FAA. More than a hundred military personnel are assigned to the FAA headquarters staff and additional numbers may be added in the future. These military people are assigned to FAA in every sense of the word. Pay and allowances are drawn from FAA funds; efficiency reports are prepared and endorsed through FAA channels just as they would be in a military command. Without these military people and their years of experience in aviation, the task that faces us would be insuperable. Without them the agency would have difficulty carrying out the mission imposed upon it.

In addition to the assignment of personnel, an Advisory Committee on FAA Matters has been established in the Department of Defense. The Under Secretary of the Air Force is designated by DOD as Chairman of the Committee, and the Air Force member is the USAF Deputy Chief of Staff for Operations. The Army and Navy have proportionate representation. Many policy issues are involved in the resolution of problems affecting aviation in general and this committee is the focal point for top-level coordination where the military services are concerned.

Endless rivers of names. Departure Board for the metropolitan area at Washington National Airport, one of four fields owned and operated as a public service by FAA. Others are two in Alaska and the new Dulles International located at Chantilly, Va.

Flight Progress Boards used at Washington National Airport. On a typical busy day there are more than 100 aircraft simultaneously airborne in the enroute corridor between New York City and Washington.

Photos by S/Sgt. Theodore F. Gaidelis

While the function of FAA covers a broad range of responsibility, the area of greatest immediate interest from the joint military-civilian point of view is the development of a common system of air navigation and air traffic control. It was with this goal in mind that FAA initiated Project Friendship in May of 1959. The purpose of Operation Friendship is to determine, in consultation with the Department of Defense, which military functions pertaining to air navigation and air traffic control—both domestically and overseas—should be transferred to FAA, when the transfer should be made, and the time-phasing necessary. This transfer will be an operation of considerable magnitude and will necessarily be conducted on a gradual basis.

Our analysis of the project to date reveals that there are some 2,095 military air navigation and air traffic control facilities spread out over 337 global locations. Of the 337 locations, 98 are in 17 foreign countries.

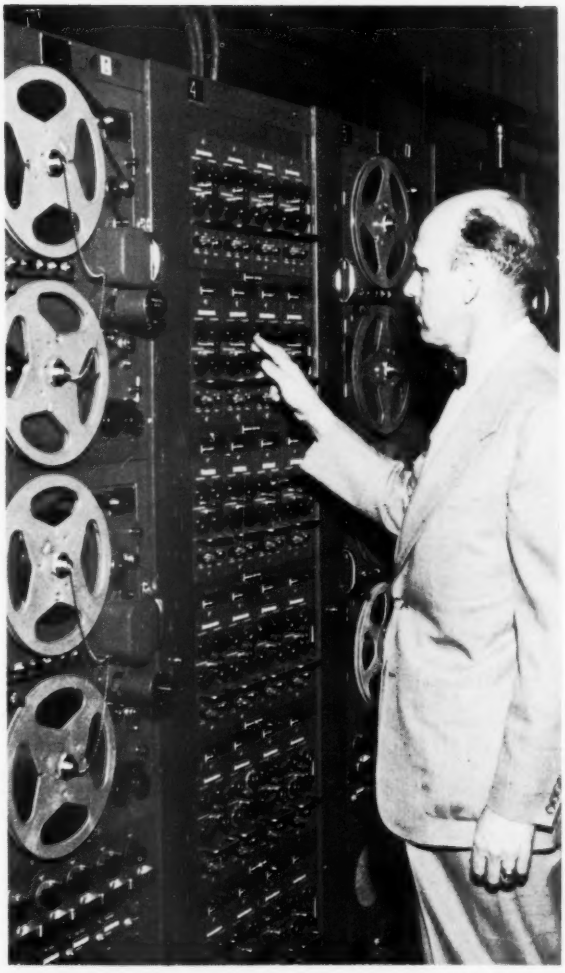
In considering the kind of military air traffic control and flight service functions suitable for assimilation we are concentrating on prime military locations where civil and military traffic are intermixed, or where the service to be delivered will provide greater benefits to users. Certain functions, facilities, and equipment peculiar to air warfare training, or tactical in nature, will remain under military authority.

With regard to military flight services, our interest is limited to functions where FAA and the military are engaged in similar activities. This would include such things as handling nontactical military flight plans, provision of air traffic control and military approval flight clearances, and handling military flight movement data. The functions selected are VFR and IFR flight plans, alerting of search and rescue, and direction finder coordination. These are considered to be largely air traffic management activities.

The tentative time-phasing for absorbing military facilities will be a coordinated FAA-DOD responsibility. The transfer of facilities could be accomplished at the rate of about 20 military locations per quarterly period. The project provides for assimilating a proportionate number of overseas facilities concurrent with the phasing over of domestic stations. This will continue to provide military commanders a domestic operations and training base for meeting their overseas requirements until such time as the overseas facilities can be manned entirely or in major part by FAA.

This philosophy of a single, unified system is not a brand-new idea and the Department of Defense is in complete agreement with the principle. The success of Project Friendship, however, will depend on the understanding and cooperation of the military services as well as all civil aviation interests.

The cooperation of the military services, and the Air Force in particular, has already played a significant part in the accomplishments of FAA to date. The present system of radar flight following and traffic advisory service for civil jets is one example of civil-military cooperation. This began as a crash program to provide high-altitude safety to the first civil jets that introduced



Every word spoken in air/ground conversations is preserved on tape at Washington National Airport. Tapes are retained on file for 30 days and then erased. Tapes help to reduce any possibility for misunderstanding between pilots and controllers.

Photo by S/Sgt. Theodore F. Gaidelis

passenger service in 1958. Using 38 radars of the Air Defense Command and the Air Training Command we can pick up the jets and track them almost all the way across country, providing flight advisory service. This would not have been possible without the use of the Air Force's long-range radar.

The Air Force and FAA joined hands last year to improve safety in terminal areas, by expanding their control procedures to provide radar traffic advisory service to all pilots, whether operating VFR or IFR.

We have worked out arrangements with the military on the use of climb-corridor restricted areas and we have freed large blocks of airspace for civil use that heretofore were denied. In the same way we have

Departure Control. Air-traffic controllers must be aware of the position and route of all aircraft in the area so that the volume of traffic can be moved with a minimum of delay.

Photo by S/Sgt. Theodore F. Gaidelis

reached satisfactory agreements with SAC and TAC on the use of reserved air refueling areas, both to reduce the potential for collision and to provide additional airspace for routine operations.

There are many other cases of fruitful cooperation with the Air Force. Recently the Air Force helped prepare a number of FAA flight operations inspectors to meet jet requirements by providing them with a full course of training in the KC-135 at Castle Air Force Base, Calif.

The Future

There is a great deal of work to be done in the years ahead, and no one can deny that many of our existing procedures are primitive. Controllers continue to inscribe information on little strips of paper just as they did 20 years ago. Long oral conversations between air and ground—sometimes leading to debate—obviously fall far short of the ideal methodology.

One of the principal reasons why the air traffic control system has failed to keep pace with expanding requirements is the fact that the urgency of military preparedness continued to endure as a part of the National scene long after the war was over. The imaginative elements of the scientific community gravitated toward the Department of Defense where exciting and stimulating things have been happening in science and technology. The military services spearheaded technological development and the sophisticated techniques which have appeared—widespread use of computers, application of data storage, automatic communications systems—have found their broadest application in weapons and weapon systems.

But now the way has been cleared for definitive action and the application of new-found knowledge to problems of air traffic control.

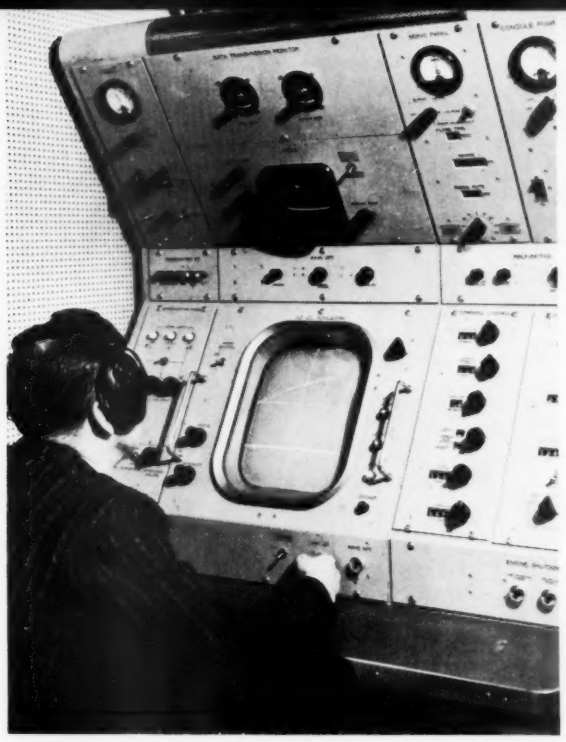
We are attacking the problem from three directions. First, there is already under way an extensive program to expand and modernize existing facilities by using equipment which is now available. Navigation coverage is being extended into new areas to provide additional flexibility and efficiency. Dozens of existing navigation aids are being modified and our goal of a single navigation system for IFR use will have the effect of expanding available air space and eliminating numerous points of traffic conflict.

In the field of long-range radar, 11 new sites have recently become operational and 24 others are scheduled for commissioning in the near future. This will bring to 40 the total number of long-range radars available for air traffic control and more than half of them will be used jointly by FAA and the Air Force. A similar program of expansion is in progress on airport surveillance radar.

The second angle of approach to air traffic control problems is intended to introduce automation to the system. The goal is to establish a semi-automatic system by 1963. This is no easy task. The development of a semi-automatic system for management of air traffic is comparable in the technical sense to the creation of the most intricate weapon system. There is no weapon system—including a satellite of any kind—more complex than the structure we envision for 1963.

In assembling the pieces that will make up this system, we go to the present state of the art. There is no need for the invention of anything basically new; a

In the tower cab at Washington National Airport FAA men work local control. USAF's Bolling AFB is directly across the river in the background.



This automatic all-weather aircraft landing system is being evaluated by FAA at National Aviation Facilities Experimental Center at Atlantic City. White dots on scope indicate two aircraft.

number of current operational devices can be adapted to our requirements. The Air Force SAGE system, for example, is in effect a system for the management of air traffic. Again with the cooperation of the Air Force, SAGE facilities and their data-processing equipment have been made available to FAA to the maximum extent possible. Some of the functions found to be common to air traffic control and air defense are identification, flight following, and radar surveillance. Nine FAA centers for en route traffic control are now in operation at the SAGE super combat installations. The joint use of the facilities will contribute to the identification capability of the air defense system and to the centralized control of air traffic in case of an emergency.

Electronic computers are already in use for processing flight data on the approaches to Washington and New York and additional computer systems will be installed shortly to serve such congested areas as Pittsburgh, Cleveland, and Boston. Initial testing with a simulated air traffic control environment is under way at FAA's National Aviation Facilities Experimental Center at Atlantic City, N. J. This system will first see operational use in the New York area.

The third approach to the air traffic problem consists of a research and development program of considerable proportions aimed at something not yet conceived. This program, constituting about 20 percent of our research and development effort, is completely uninhibited. It is our avowed objective to eliminate the airways structure eventually. The very existence of an air corridor contributes to the bottleneck; it condenses the traffic. With surveillance radar on the one hand and the computation and storage of data on the other, air traffic will be freed from one of its most restrictive characteristics. If the possibility of conflict develops, the system will predict it and take corrective action. This is a formidable goal, admittedly, in view of what can be expected in the way of further traffic increases.

At the present time, the certificated air carriers operate about 1,900 aircraft. Although passenger traffic will increase by about 13 percent per year, the number of planes in service will remain approximately the same. The trend is toward larger and faster aircraft carrying more people or a larger tonnage of freight.

Military aircraft now number about 22,000, and this figure is expected to remain fairly stable—or even shrink to some extent as the uninhabited vehicle comes more to the fore. But speed will continue to increase and operational ceilings continue to rise.

The area of greatest anticipated expansion—in terms of numbers of aircraft—is general aviation, which embraces everything from the farmer spraying his fields with insecticide to the multi-engine planes operated by private corporations. There are now some 70,000 aircraft of all types in this category. This number is expected to mount with increasing rapidity until we will have 120,000 private planes crisscrossing overhead by 1975. Obviously this traffic cannot be allowed to meander into the scramble corridors used by air defense interceptors. Nor will the operating speed of the big jets allow any casual conflict of interests.

It will take time, much effort, and a considerable expenditure of money to develop a system capable of coping with this volume of traffic. However, we in FAA feel that our plans for solving the problems are sound. We believe we will be successful.

JUNGLE RESCUE

Tule had to swim the raging, debris-filled river. If he failed, five men might die.

by TSgt. Harold Craven, *Airman Staff*

THE air route from Paitilla Airport, Panama City, to Porvenir Island, San Blas Archipelago, crosses an expanse of almost impenetrable jungle. On October 31, 1958, when jungle rivers were swollen by seasonal rains, a privately owned Cessna 180, carrying a pilot and four passengers, disappeared during a flight to Porvenir.

At Albrook AFB, Canal Zone, the Air Rescue Coordinating Center went into action. Soon U. S. Air Force, Army aircraft and civilian airplanes of Panamanian and U. S. registry were engaged in a gigantic search effort. Maj. Lloyd McGrady, chief of the center, called it one of the most intensive search operations he had ever seen.

When six days of aerial searching failed to provide a clue to the missing airplane, a ground search was organized. At its peak it involved some 325 men, including U. S. military personnel, members of Panama's *Guardia Nacional,* and civilian volunteers. Runners and two-way radios served as lines of communication. Still no trace of the missing plane was or has been found.

At the beginning of the ground search Gertrudis "Tule" Arauz, a Panamanian employed at Albrook AFB as a tropic survival instructor, was on annual leave waiting for his wife to give birth to his eighth child. Search and rescue duties were not included in his job description, and under the circumstances, the last thing he wanted to do was return to Albrook.

"No one would blame me," he told himself, "for staying home with Felicia. A husband should be with his wife at such a time."

Nevertheless, Tule felt duty bound to contact his supervisor and place himself on voluntary alert. He knew he was more qualified to cope with jungle hazards than many of the men who had volunteered their services. He made himself available.

Tule's action surprised no one. During his employment at Albrook he had earned a reputation for absolute reliability and devotion to duty, and had gone far beyond the requirements of his teaching job to increase his potential to the Air Force. He had studied radio communications procedures and helicopter operational capabilities, and he had familiarized himself with many items of Air Force survival equipment not included in his tropic survival course. His recently acquired knowledge, plus a familiarity with the jungle dating back to his childhood, had earned him high regard at Albrook.

On the afternoon of November 9, after two search parties had been unreported for three days, Tule was contacted. The message was simple:

"Senor Arauz, we need you."

Tule returned the same day to find that one of the missing groups had returned by boat. Then a member of the second group walked out of the jungle and reported the approximate location of his associates. He said two of the men, one U. S. citizen and the *Guardia Nacional* member in charge of the group, were ill and unable to move. Three others were near exhaustion. They needed food, medical care, and leadership.

On the following morning, Tule and two Choco Indians tried to reach the men, but the swollen rivers were too much for their dugout canoe and they had to

turn back. On the morning of November 11 Tule flew over the headwaters of the Chagres River in an Army helicopter, piloted by 1st Lt. Wallace Franklin. Eventually the missing men were spotted in a canyon, stranded in the middle of a fork between two rivers. A helicopter landing in the canyon would have been extremely dangerous so a slightly less hazardous approach was selected approximately one half mile downstream.

Tule Jumps

While Lt. Franklin weighed the dangers of putting the helicopter down at this location, Tule removed his shoes. He asked Franklin to descend low enough to permit him to drop into the stream.

"I can land feet first near shore. The water will be deep enough to soften the landing and shallow enough for me to hold the radio set out of the water," he told the pilot.

The lieutenant complied and Tule went over the side with the radio transceiver, a medical kit, and emergency rations. He hit the water feet first as he had planned, but he had misjudged the depth. It was more shallow than he had expected and he felt sharp pains as his feet struck the rocky bottom. He managed to keep his balance; a trickle of blood stained the muddy water as he waded ashore. The injuries proved to be superficial and he started walking upstream. When he reached a point opposite the stranded men he yelled words of encouragement and continued walking.

The men returned the greeting and watched Tule make his way upstream and disappear from view. They had hope now, but it was blended with doubt. The man would have to cross 75 feet of the most treacherous current some of them had ever seen, and he would have to dodge trees, limbs, and other debris. They knew they needed a miracle and they watched the river closely, hoping their would-be rescuer would appear as its conqueror, not its victim.

Tule was fully aware of the dangers he had elected to face. Ordinarily he wouldn't consider swimming such a river with both hands free. Now he would have to do it while holding a radio transceiver out of the water. He remembered that in the past he had always found a reserve of strength and skill in times of danger and he hoped that this incident would not prove an exception. He picked a point well upstream and entered the water.

Wild Game

The current seemed swifter than it had first appeared to be and suddenly he was being carried swiftly downstream. When it appeared that he would be swept past the stranded search party his reserve strength came to the fore and soon he was on shore, smiling triumphantly and fighting for breath. He went immediately to the sick members of the party and found their illness to be severe but not as bad as he had expected. He radioed the helicopter and told Lieutenant Franklin that he would move the men downstream to a pickup point on the following day. Then he borrowed a gun from one of the men and shot two turkeys to supplement the emergency rations.

Maj. Gen. Leland S. Stranahan, Commander, Caribbean Air Command, presents the Exceptional Civilian Service Award to Gertrudis "Tule" Arauz for heroic and exemplary service.

When the turkeys were cooked and eaten Tule began weaving a rope from the short pliable ends of vines in the area. It was a tedious task and when night came he was ready to sleep.

At dawn the river was still high. Tule secured one end of the vine rope and plunged into the water with the other end. This time he was not burdened with supplies and equipment and the crossing was easier. He stretched the rope across the river and tied it carefully, then returned to the camp with the rope's aid.

His next task was to get the men across the river. The rope served its purpose well. After he had helped the last man across he returned for their supplies and equipment. When the final crossing had been accomplished he took charge of the group and started leading the march toward the pickup point downstream. One of the men was still very ill and Tule assisted him along the rugged route. Eventually, when it appeared the sick man could go no farther, the helicopter appeared. Tule radioed the pilot and asked him to drop a rubber liferaft.

Aerial Pickup

The liferaft was dropped at the appointed place but the tired men missed it and the current began carrying it downstream. Tule, by this time near exhaustion, plunged into the stream and retrieved it. The sick man and most of the equipment were put aboard the raft. Eventually the pickup point was reached and the group was airlifted to civilization.

At Albrook congratulations were heaped upon Tule, and he accepted them with modesty, preferring to believe that no man should be praised for merely doing something that had to be done. He left the base quickly and returned home. There he learned that Felicia had gone to the hospital and had borne him his eighth child, a fine son who was to be called Rolando. He went to the hospital to see Felicia and the boy and he talked with his wife about many things, including their dream of eventually buying a new home.

Upon his return to duty Arauz found himself a popular hero, due to the extensive coverage his deeds had been given in newspapers of the area. He learned that President Ernesto de la Guardia had recommended the striking of a special medal for him and had asked the Air Force to allow *Guardia Nacional* members to attend Tule's classes in jungle survival. His supervisor, Mr. H. Morgan Smith, informed him that the U. S. Army wanted to send representatives of its Jungle Warfare Center to his classes. Several Air Force members who were not required to undergo tropic survival training had also asked to be enrolled in his classes.

Official recognition from the Air Force came a year later in the office of Maj. Gen. Leland S. Stranathan, Commander, Caribbean Air Command. There, in the presence of his wife and children and representatives of the United States and Panamanian governments, Tule was given the Exceptional Civilian Service Award, the highest honor the Air Force can bestow upon a civilian employee, and a check for $500, the amount he needed to make the down payment on a new home for his family.

The award ceremony included the reading of a citation that described the hazards Arauz had overcome during the jungle rescue mission. The concluding words were: "His heroic and exemplary performance reflects great credit upon himself and the United States Air Force."

Translation

Six-year-old Jose Arauz didn't understand the words in the citation, so he asked his older brother, Luis, seven, to explain. Luis didn't understand them either but he knew the significance of a medal and he had seen the look of pride on his mother's face when the medal was pinned on his father's coat.

"The paper from the United States says our father is a very great man," Luis told Jose.

Representatives of two governments nodded their agreement.

WAS YOUR CHILD BORN OVERSEAS?

by Lt. Col. Jake L. Abraham
Legal Assistance Office
Military Affairs Division
Office of The Judge Advocate General, USAF

If you are a typical American parent you undoubtedly take considerable pride in protecting the welfare of your children. They eat the proper balance of food, visit the dentist regularly, and report to the dispensary for shots or a periodic check-up as required. But are you completely sure of yourself with respect to all aspects of your family's welfare?

There have been thousands of children born overseas during the past 15 years who may not have the best proof of their American citizenship and whose birth records may be declared insufficient when presented for school, employment, passport, entry into the Armed Forces, and similar uses.

A lack of complete understanding in this important area has occasioned concern among officials of the Department of Defense and other Government agencies. Certain changes in procedures—some already initiated by the departments concerned and others under consideration—may clarify the entire subject of citizenship and birth records for parents in the future. In the meantime, for the benefit of all, here is a brief discussion of some of the records presently available and the procedures for obtaining them.

As promptly as possible after the birth of your child overseas, you should report to the nearest United States counsular office with all available documents associated with your marriage and the birth of your child. These may include birth certificate of parents or equivalent, your marriage certificate, certificate issued by the hospital where the birth took place, and the certificate of birth issued by the office of vital statistics of the host country. It is recommended, incidentally, that as many copies as possible of the latter, up to a maximum of eight be obtained.

On the basis of the information you provide, assuming that it is sufficient, the consular office will prepare a "Report of the Birth Abroad of a Citizen of the United States" (Form FS-240). This report is an affidavit sworn to by you as the parent. It establishes that for passport or related purposes the child has a valid claim to American citizenship. This report is prepared in triplicate. One copy is forwarded by the Consul to Washington, D. C., for filing; the second is retained by the consul; and the third will be given to you upon request after payment of a fee of $1.50.

Although recognized by the Department of State, this Report of Birth is not considered conclusive proof of American citizenship. Furthermore, since the report may contain private and personal information, you may find it unsuitable when registering your child in school. In later years your child may not wish to present it to a prospective employer.

For this reason a new procedure was inaugurated late in 1959 whereby the consul may issue a Certification of Birth in addition to making his report on Form FS-240. This certification is similar in size and appearance to birth certificates issued by local authorities in the United States. It contains no background information and bears only the name of the child and the date and place where birth was recorded. This certification will be issued by the consul after completion of Form FS-240, without fee.

If this certification was not available when your child was born you may now obtain it by forwarding your request with complete name of child, date and place of birth, names of parents, and a fee of $2.50 to the Authentication Officer, Department of State, Washington 25, D. C. *(Continued next page)*

Although the Certification of Birth issued by the Department of State may prove very useful to your child for a number of purposes, the child is still not, unfortunately, possessed of the best proof of his American citizenship.

At the present time, the only single document which will serve as evidence of citizenship for all purposes for persons born of American parents outside the United States is the Certificate of Citizenship issued by the Immigration and Naturalization Service, a division of the Department of Justice.

Under existing law you may apply for the Certificate of Citizenship only *after* your child enters the United States. The necessary form (N-600) may be obtained from any of the 32 district offices of the Immigration and Naturalization Service around the country or from the Washington, D. C. headquarters at 311 Old Post Office Building.

For children under the age of 14 years the application may be completed by the parent, who must appear personally before an officer of the Immigration and Naturalization Service to execute the necessary affidavit. Supporting documents similar to those required for the consul's original report of birth may be required and it is well to remember that photostatic copies will be accepted only when originals are presented at the same time for comparison. A fee of $5.00 must accompany the application for a Certificate of Citizenship.

Legislation Contemplated

Legislation has been introduced in the current Congress which is intended to simplify the procedure for obtaining the Certificate of Citizenship. This proposed amendment to the Immigration and Naturalization Act of 1952 will, if enacted, permit the Department of Justice to issue a Certificate of Citizenship on the basis of the consul's Certification of Birth, and without the requirement of any further proof of eligibility. In addition, under this plan, the certificate could be issued while you and your family are still overseas. Thus, not only would all necessary action be completed while the matter is still fresh in the parents' minds, but it would be done under the expert guidance and advice of a governmental official.

Some people may wonder about the need for all these documents. Are they really necessary? It is difficult to say with certainty. Many Americans live a lifetime without ever having to furnish proof of citizenship. Even proof of one's age may be required no more than half a dozen times in an entire career. Nevertheless, since no one knows what the future will bring, the best plan undoubtedly is to play it safe by providing your child with all the safeguards available. Your legal assistance officer will help if necessary. There is a little trouble involved and a modest outlay of money, but some day in the future, your child may thank you heartily for your effort.

in my opinion

Attitudes Are More Important Than Facts

by MSgt. A. T. Buono, *Homestead AFB, Fla.*

ATTITUDES are more important than facts. This statement was posted in a section that I inspected. When I first saw it I thought it was a stupid statement and a definite reflection upon the mental shortcomings of the one who posted it.

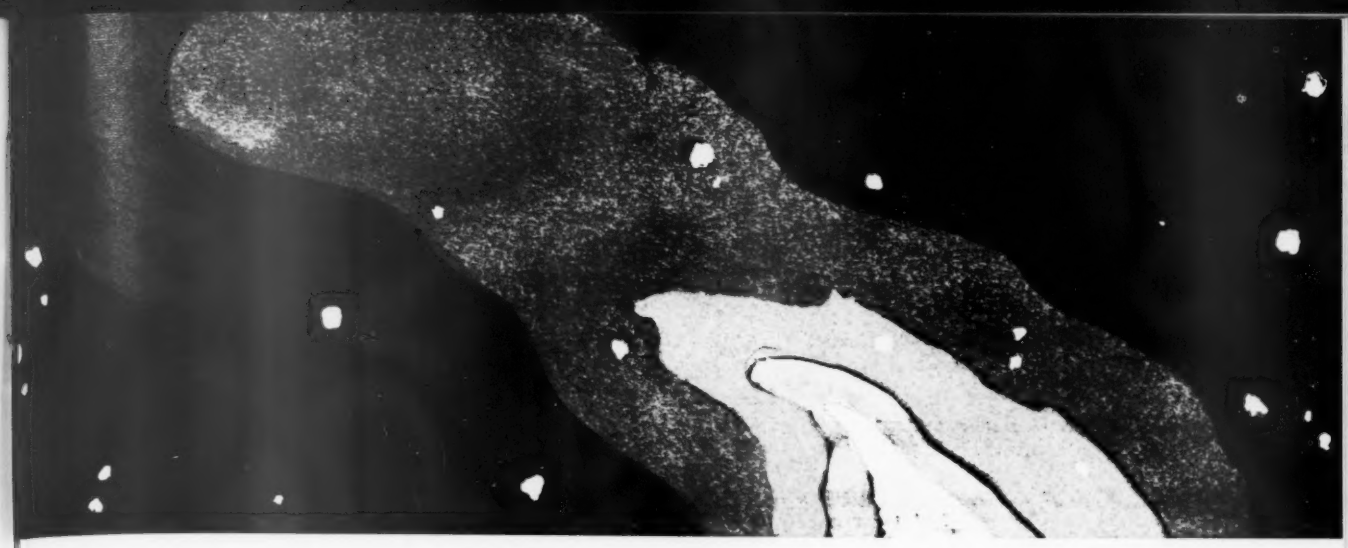
As NCOIC of the inspection section I had learned to rely rather heavily upon facts. I had seen too many complaints and excuses vanish when the facts were presented. I had seen too many floundering organizations blossom into efficient units when they were bolstered with facts. How in the world could anyone in his right mind say that attitudes are better than facts? However, the more I tried to ridicule this "attitude" business the more it persisted; and the more it persisted, the more I reflected on it. Then it dawned on me that instead of a stupid statement I had really discovered a profound one.

I asked myself, "What was the one common element that all organizations had when I inspected them?" That one common element, of course, was attitude. Then I expanded this to, "Was there any difference in attitude between a successful organization and an unsuccessful one?" By golly there was! What was the difference?

The successful unit made full advantage of the facts that were helpful and they overrode the facts that hindered. This was the formula of the successful outfit. How did the unsuccessful outfit use this formula? They used it as an inverse proportion. Where they should have taken advantage of the facts they disregarded them and they were usually hypnotized into failure by facts that hindered them.

Now you might say so far all you have read are so many words about the effect of these attitudes on some vague organizations. But how about some concrete examples we can see for ourselves? Well, there are many examples all around us of attitudes that overrode facts that could have been hinderances. Take a close look at our aircraft. There were numerous facts presented to show that things heavier than air just couldn't fly, much less carry payloads. Look at the telephone, the radio, TV, etc. All of them would have been, just a short while back, sufficient cause to throw the person who expounded them into jail or an institute for the demented. Yet, these hindering facts were overcome and look at the results!

A discovery that is not shared and put to some good use is really not much of a discovery. Therefore, suppose we all take a close look at ourselves and ponder a bit on our attitudes. Let's develop healthier attitudes and then the next time we talk to the boss instead of saying "Chief, because of a certain condition we can't do the job," let's say, "Chief, some conditions will hinder us but, *we'll get the job done!*"



The Sounding Firmament

by William A. Kinney, *Airman Staff*

"A new kind of static too small to be of importance . . ."

A verdict like this might well have come from the abandoned potato farm but the inquiring mind at work stubbornly refused to settle for such an empty answer. And so began what has unfolded into a fantastic story. It is already interwoven significantly in the opening chapters of man's assaults on space and promises to figure with enhanced importance in the chapters yet to be written.

That former potato farm is located some 50 miles southwest of New York City near Holmdel, N. J., not far from the Revolutionary battlefield of Monmouth where the legend of Molly Pitcher was born.

To the idle acres in 1930 came Karl Guthe Jansky, a 25-year-old engineer. It is of interest to note in passing that he was the grandson of Czech immigrants because the results of his work offer another example of early contributions to U. S. life from children of those who have made this their freely adopted land.

Jansky had joined the staff of the Bell Telephone Laboratories a few years earlier upon graduation from the University of Wisconsin. The assignment which took him to Holmdel was to seek to identify the sources of static which was causing interference in ship-to-shore and transatlantic radio communications. His work site had been acquired because its rural setting was sufficiently remote from the manmade electrical disturbances which abound in metropolitan areas.

Under the open sky he rigged up an experimental aerial about 100 feet long, consisting of two parallel rows of brass piping secured to wooden scaffolding. The base of the bizarre looking apparatus was mounted on salvaged automobile wheels so that the whole array could be moved in a circle like a turntable. Jansky's notes refer to the rig as "the merry-go-round."

The research under way, Jansky proved very meticulous about keeping notes. He registered good progress in sorting out and identifying major sources of interference—thunderstorms and other natural causes of static, as well as the manmade variety traceable to power lines, transmitters, and other equipment.

Night after night, however, the Rube Goldberg antenna picked up one persistent kind of static which baffled him. He heard it as a faint, steady hissing noise, and as the months slipped by he began to speculate whether it might be nonterrestrial in origin. A peculiar thing about the long, drawnout whooshshsh which his earphones brought him was that each day he was picking it up a few minutes earlier than the day before.

In one of many tireless reviews of his notes Jansky was struck by the fact that his mysterious moving noise source showed a consistent time differential of four minutes every 24 hours. Something inspired him to start digging into astronomy books, and he had the answer.

The so-called "fixed" stars rise—or come over the horizon—four minutes earlier at each appearance because the star or sidereal day is that much shorter than the solar day. Some careful astronomical detective work enabled Jansky to establish that his strange noise source was located in the constellation Sagittarius at the center of the Milky Way. Some phenomenon in

space generated a steady, unchanging sound.

This discovery, which came early in 1933, marked the birth of radio astronomy.

With appropriate fanfare the news was made public a few months later in the spring. NBC carried a special program which introduced listeners to a variety of noises emanating from stars and other celestial sources. This was "the music of the spheres" of which poets had sung, although the orchestration may have seemed oddly inharmonious to a layman's ear.

Scientific reaction varied but the full implications of Jansky's discovery obviously were not grasped. Professional astronomers made no move to exploit it as a new means for exploring the exterior cosmos. Jansky himself was presently assigned to other work, although his interest in this field continued lively, and he wrote further on the subject. Scientists today marvel that the breakthrough—one of the most important in the century and fully meriting the Nobel Award it was not to receive—created such a small, transitory stir at the time.

Happily, the breakthrough did fire the imagination of another individual, Grote Reber, a radio set designer in Wheaton, Ill. His driving ambition suddenly was to possess a radio telescope of his own, but it should be an instrument with greater capabilities than Jansky's "merry-go-round." When he described his ideas to a contractor, he was quoted a price of $7,000 for the construction of what he wanted. That was a rude shock: the sum was well beyond his modest means.

But Reber's dream was not a fragile thing to be shattered by the cold reality of the cost involved. The man was reaching for the stars. Very well, if he could not afford to have the equipment constructed for him, he'd try his hand at building it himself. It was a time-consuming project. The important matter of earning a livelihood kept Reber tied by day to his job of designing radio sets. After hours and on his days off he worked in his backyard, slowly and painstakingly putting his instrument together.

In 1937 he had it completed—a strange looking contraption to the eyes of his neighbors. It consisted of a large, metal "pie plate," perched atop a wooden support structure which suggested the skeleton of a bowl. The plate, measuring 31.5 feet across, was made of fitted sections cut from galvanized sheet steel. For the materials and other components required, the finished apparatus represented a cash outlay of $2,000, quite apart from the labor involved.

An enthusiast proud of his creation, Reber was eager to explain to fellow townsmen that his "pie plate" was a circular collector of radio waves which could be focused at an upright rod—the dipole—in the center. What's more the plate could be trained on any portion of the visible heavens like an optical telescope. This was an important improvement over the Holmdel "merry-go-round" for, while that array could be rotated, the antenna's angle with relation to the sky was fixed; it could not be shifted in the interests of directivity.

However outlandish Reber's creation may have looked to the curious of the day, it introduced the concept of the paraboloidal, directive antenna which is embodied with refinements in the "big dishes" of radio astronomy today. When he started his untutored observations of cosmic sounds, he also pioneered in operating at the higher frequencies.

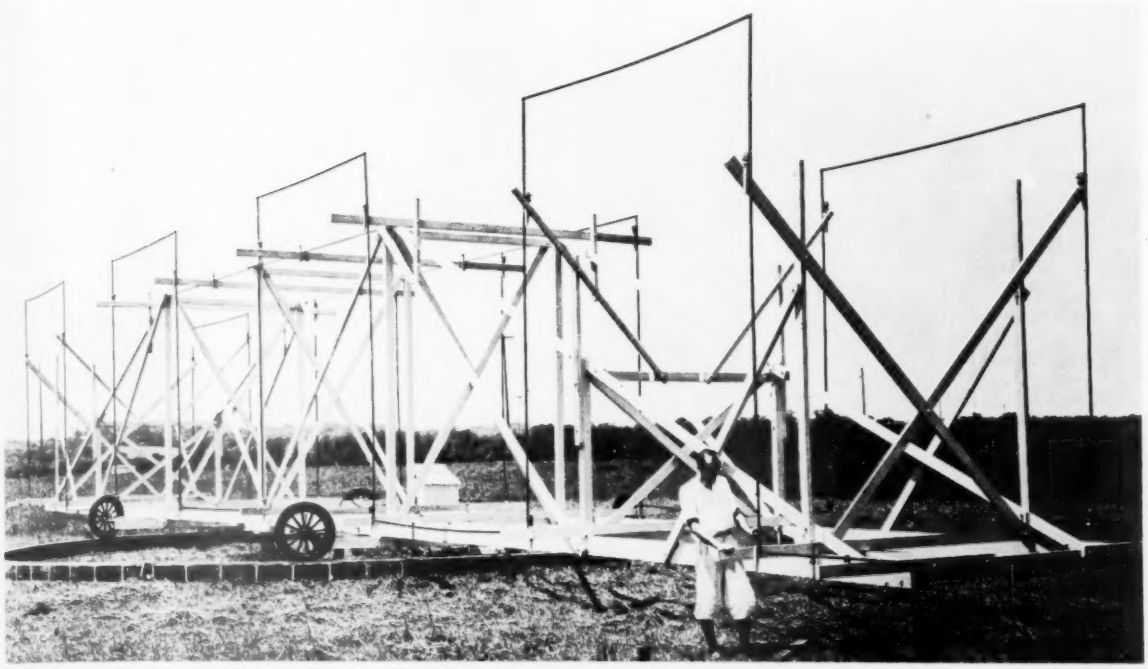
***FATHER OF RADIO ASTRONOMY** Karl Jansky opened the way for what is now the fastest growing field of scientific endeavor when he discovered in the early 1930s that exterior space contains phantom transmitters of enormous power, transmitting radio waves which give man new knowledge of the mysterious universe. Although real fame did not come to him in his lifetime, the increasing number of radio observatories around the world today makes an impressive array of monuments to his genius.*

Photo courtesy Bell Telephone Laboratories

Reber's research quickly corroborated what Jansky had found, that a celestial sonic source existed in Sagittarius. He located numerous other areas generating radiation. He made the discovery that many bright stars emitted no sound yet there were seemingly blank regions in space which were very "noisy." He compiled the first radio map of the exterior cosmos. His contributions to the infant science are now belatedly acknowledged as impressive. He wrote, but for an unresponsive audience. Radio astronomy remained an unreal preserve and for most of a decade Reber was the only professional who worked it with the dedication of a true scientist. He is still contributing to the development of radio astronomy.

If Jansky and his Illinois disciple found themselves prophets without honor in their own country (and everywhere else, for that matter), a line of independent research being pushed during the '30s would lead unknowingly to their inevitable vindication. The work was directed at developing practical applications for a 1922 invention with the unwieldly name, Radio Detecting And Ranging, since more familiar as radar.

By the time Hitler in 1939 unleashed the conflict



"MERRY-GO-ROUND" was the name Karl Jansky gave to this improvised rotating antenna which he used in the long, persevering months of research that led to his great breakthrough. Looking more like an inquisitive baseball player than a dedicated scientist, the young genius examines a fitting on the odd rig that turned out to be man's first radio telescope.

Photo courtesy Bell Telephone Laboratories

which was to be global, only limited capabilities had been developed by this work, yet radar was able to play an invaluable role in the "wizard war," as Churchill called it, which helped Britain with scientific knowhow through the critical days when she stood alone. Radar's performance in alerting ground and air defenses for enemy strikes cost the Luftwaffe grievous losses but responsible Britons knew it was unlikely they would command this advantage indefinitely. There was no dearth of very able scientists in the enemy's camp and sooner or later one would hit upon the nature of the secret equipment and devise countermeasures to blunt its effectiveness.

For the embattled Allies the opening months of 1942 were bleak with disaster. Then on February 27 the entire early warning radar net around Southampton, a vital port for U. K. logistics, was massively jammed by some unknown kind of interference. No major air strike followed, however. Again the next day the intense jamming materialized, yet with no Luftwaffe effort to exploit it. Had the Nazis finally found a method for rendering radar useless and were these tests to satisfy themselves before they gambled with bombers?

The big question was checked to the scientists responsible for the implements of the "wizard war." What type interference was the enemy employing? After long hours of intensive study one physicist, J. S. Hey, finally arrived at the answer which held a highly secret classification throughout the rest of WW II. The interference that smothered the radar net was not manufactured by the Nazis just across the narrow Channel; it had originated 93 million miles away in a storm of radiation swirling from the Sun.

This wartime discovery ironically served to put the published papers of Jansky and Reber in an entirely new light. The two men had, after all, been correct in reporting that numerous radio sources existed in the universe beyond this small planet. Their work was unquestionably one of the century's scientific landmarks. While the war was to drag on for another three years, radio astronomy had at last won recognition.

With the end of hostilities scientists in various countries turned expectantly to this still novel means for exploring the vast reaches of the cosmos. In Britain, the Netherlands, Australia, and the U. S. S. R. little time elapsed before planning was under way both on instrument design and observatory construction. It remains a source of some mystification but the U. S. failed to move immediately with comparable energy and dispatch. Not until toward the mid '50s did programs assume the substantial proportions which might be expected in a country which possessed the world's most powerful optical telescopes and had a leading reputation in astronomical research.

Britain paced the field for the first postwar decade, a performance not without a touch of the inspirational. Her program was born in the stern period of austerity when the nation faced alternatives which almost read:

***FIRST SPACE RADIO SOURCE** to be identified lies deep in the celestial reaches beyond this majestic constellation,* Sagittarius *(The Archer). In that direction is the center of our galaxy, the Milky Way, a region which optical telescopes are unable to observe. Scientists place this radio transmitter very near the Milky Way's hub, which means that the radiation waves being broadcast travel through space for approximately 156,000,000,000,000,000 miles (15 zeros) before reaching radio telescopes on Earth.*

Photo courtesy Lick Observatory

ROLL OF FAME

Electrical terms honor many scientists who have contributed to man's knowledge and mastery of this form of energy. They include Andre Marie *Ampere,* Charles A. de *Coulomb,* Michael *Faraday,* Karl F. *Gauss,* James P. *Joule,* Georg S.*Ohm,* James *Watt,* and Allessandra *Volta.*

Add to the list Karl G. Jansky, discoverer of radio astronomy. A jansky is the unit for measuring the strength of radio emissions from sources in space. Specifically one jansky is equal to one watt per square meter per cycle per second.

Export or Die. Except for minimal amounts, all manufactured products were earmarked for sale abroad in markets paying the "hard" currencies so desperately needed to shore up a tottering economy. Steel, electronic equipment, and the like were in particular demand for this foreign trade. All nonessential domestic requirements went unfilled.

In this stark economic picture, provisions for a relatively new science would seem to belong far down the list. It didn't turn out that way. With remarkable foresight Britain evaluated the speedy development of radio astronomy facilities as a postwar essential, even though the work to be done was pure research and the only earnings produced would be in the currency of knowledge. Thousands of tons of steel, large quantities of electronic equipment, motors, and other expensive items were diverted from the export market to enable the science to get into the operational clear.

Completed showpiece of the program is the Free World's largest steerable radio telescope at Jodrell Bank, an instrument representing a total of seven years in planning and construction. Its movable parts alone weigh 2,000 tons. With a diameter of 250 feet, the big dish is almost twice as large as the dome of the U. S. Capitol which measures only 135.5 feet across. And the observatory has a swords-into-plowshares touch, the rack-and-gear mechanism which tilts the huge parabolid came from a scrapped British battleship.

By a fortuitous concidence Jordell Bank had reached experimental service status by the time the Space Age burst upon mankind. While the observatory's programmed work concerns meteors, aurora, the Moon, and galactic as well as extragalactic sources of radio energy, it has frequently doubled in brass, so to speak, tracking satellites and proble vehicles.

Karl Jansky did not live to see radar astronomy really come into its own with great observatories around the globe and even huger ones under construction. Never of robust health, he died at the age of 44 in 1950. His monument is the impressive store of new information man has accumulated on the nature of the physical universe during the short span of years since his passing and the even more fabulous returns yet to come. Dr. Fred Hoyle, the British astronomer now doing research in this country, makes this comment:

"No literary genius could have invented a story one-hundredth part as fantastic as the sober facts that have been uncovered by this astronomical science."

What is radio astronomy learning about the remote reaches of space? It is likely that celestial signals include some transmitted by intelligent sources?

(To be concluded next month)

In the Name of Congress

No. 20 IN A SERIES

D-Day was less than two months in the future and German defenses against increasing air attacks and mounting devastation were reaching the level of desperation. This do-or-die Nazi stand spelled . . .

Last Mission for the Bertie Lee

by SMSgt. Hal Bamford

By the morning of April 11, 1944, crisis was no longer a novelty for Lt. Edward S. Michael. In his three-plus years of military service, the young officer had faced a series of such events with determination and aplomb—but this day was to provide the most trying test of all.

Edward Michael had enlisted in the Army Air Corps on November 4, 1940. His goal was aviation cadets and a flying career, a dream he had nurtured since preteens.

Early in 1941, Private Michael was transferred to Wheeler Field, Hawaii, where he trained as an aircraft mechanic. For weeks, however, he spent every waking off-duty hour cramming for aviation cadet examination. Late that fall the opportunity came but, unfortunately, he failed—missing his cherished goal by a single point.

This disappointment only caused him to study harder so that when the chance might again present itself, he would be ready. Before that opportunity could arrive, the Japanese attacked Hawaii and Michael joined his comrades in makeshift combat against the enemy.

Spurred on by this sudden turn of events, when opportunity again knocked, Michael was ready. In mid-1942, he was accepted for cadet training and returned to the States. On April 12, 1943, he attained his long-elusive goal—a commission and his pilot wings at Douglas Army Air Field, Ariz.

Within weeks, Lt. Ed Michael had returned to combat. This time his assignment took him to England where he became a member of the 364th Bomb Squadron, 305th Bomb Group, based at Chelveston. Michael and his new crew were allocated a tour of 28 missions and as the months ground past, the mission total grew.

At 0400 on the morning of April 11, they were briefed for the 26th mission of their assigned block. The target was Stettin, Germany, deep in the Nazi nation's heart. It was to be the last mission for their B-17, the *Bertie Lee*.

Their *Fortress,* armed with forty-two 100-pound incendiary bombs, was airborne at 0700. Slowly they climbed to altitude and took their position in Purple Heart corner, on top of the wing formation. The deadly flight turned toward Germany and settled in for the long haul.

For several hours, all went well. But, within miles of the target, the formation was jumped by nearly 300 enemy fighters. The citation which carried the award of Lieutenant Michael's Medal of Honor—USAF's 29th—graphically tells the story of the next hours.

For conspicuous gallantry and intrepidity above and beyond the call of duty while serving as a pilot of a B-17 aircraft on a heavy-bombardment mission to Germany, 11 April 1944. The group in which Lieutenant Michael was flying was attacked by a swarm of fighters. His plane was singled out and the fighters pressed their attacks home recklessly, completely dis-

Lt. Edward S. Michael

regarding the Allied fighter escort and their own intense flak. His plane was riddled from nose to tail with exploding cannon shells and knocked out of formation, with a large number of fighters following it down, blasting it with cannon fire as it descended. A cannon shell exploded in the cockpit, wounded the copilot, wrecked the instruments, and blew out the side window. Lieutenant Michael was seriously and painfully wounded in the right thigh. Hydraulic fluid filmed over the windshield making visibility impossible, and smoke filled the cockpit. The controls failed to respond and 3,000 feet were lost before he succeeded in leveling off. The radio operator informed him that the whole bomb bay was in flames as a result of the explosion of three cannon shells, which had ignited the incendiaries. With a full load of incendiaries in the bomb bay and a considerable gas load in the tanks, the danger of fire enveloping the plane and the tanks exploding seemed imminent. When the emergency release lever failed to function, Lieutenant Michael at once gave the order to bail out and seven of the crew left the plane. Seeing the bombardier firing the navigator's gun at the enemy planes, Lieutenant Michael ordered him to bail out as the plane was liable to explode at any minute. When the bombardier looked for his parachute he found that it had been riddled with 20-mm. fragments and was useless. Lieutenant Michael, seeing the ruined parachute, realized that if the plane was abandoned the bombardier would perish and decided that the only chance would be a crash landing. Completely disregarding his own painful and profusely bleeding wounds, but thinking only of the safety of the remaining crew members, he gallantly evaded the enemy, using violent evasive action despite the battered condition of the plane. After the plane had been under sustained enemy attack for fully 45 minutes, Lieutenant Michael finally lost the persistent fighters in a cloud bank. Upon emerging, an accurate barrage of flak caused him to come down to tree-top level where flak towers poured a continuous rain of fire on the plane. He continued into France, realizing that at any moment a crash landing might have to be attempted, but trying to get as far as possible to increase escape possibilities if a safe landing could be achieved. Lieutenant Michael flew the plane until he became exhausted from the loss of blood, which had formed on the floor in pools, and he lost consciousness. The copilot succeeding in reaching England and sighted a RAF field near the coast. Lieutenant Michael finally regained consciousness and insisted upon taking over the controls to land the plane. The undercarriage was useless; the bomb bay doors were jammed open; the hydraulic system and altimeter were shot out. In addition, there was no air-speed indicator, the ball turret was jammed with the guns pointing downward, and the flaps would not respond. Despite these apparently insurmountable obstacles, he landed the plane without mishap.

As the ship came to rest, Lieutenant Michael fainted again from loss of blood and complete exhaustion and was rushed to a nearby hospital as were Lts. John Lieber and Franklin Westberg, his bombardier and copilot. The wounds of the latter two were superficial and they were soon released.

For seven weeks, however, the courageous pilot fought to regain his health. Throughout those painful days, he worried continually about the fate of the seven men who had bailed out of the crippled plane on his orders. Gradually, his worry gave way to a double vow. He would not shave until the fate of his crewmates was known and he would contact the family of every crew member and tell them the full circumstances surrounding his decision.

After his recovery, Lieutenant Michael was returned to the States and assumed duties as a B-17 instructor pilot. Again, his determination to fulfill his pledge drove him to constant research in an effort to determine the fate of his crew.

Slowly, as the months passed, he was able to determine that six of the seven men were alive and well, but housed in German prisoner of war camps. Simultaneously, he was contacting his crewmen's worried families in an effort to ease their trial.

Early in January 1945, he was informed he was to receive the Medal of Honor and ordered to report to Washington where President Roosevelt would make the presentation.

On the morning of January 10, the same day FDR was to write the finish to this heroic story, Lieutenant Michael was informed that the seventh member of his crew had been reported as a prisoner of war.

It was a clean-shaven Lt. Edward S. Michael who proudly faced the President of the United States later that day to receive this Nation's highest award.

He is presently assigned to the 1501st Transport Squadron, Travis AFB, Calif. And in his own words, "with all my heart and mind, I hope to fly and maybe command a KC-135 tanker outfit."

If determination is the key needed to obtain this goal, Major Michael has long ago proven that this facet is but one of the strong points of a driving ambition that knows no defeat.

SLANTS ON SPACE

Perpetually concealed in a dense, virtually featureless shroud of atmosphere, Venus is the riddle of the planetary system. For almost three centuries astronomers have sought to determine how long it takes the planet to rotate on its axis. The estimates range all the way from 22 hours, 17 minutes to several days, weeks, more than a month, and even as much as 224 days, 16 hours, 48 minutes.

The highest figure is the same as that for the length of time Venus takes to revolve once around the Sun. If this is correct, it would mean that the planet always has the same hemisphere turned toward the Sun, hence there would be very great temperature differential between the two sides.

Efforts to arrive at temperatures in the environment of Venus likewise have produced a broad contrast in readings. Thermoelectric observations of the top of the planet's atmosphere have given results which run from 38 degrees below zero, Fahrenheit, to 122 degrees above. Spectral observations have yielded a range of from 54 to 117 degrees above for somewhere in the atmosphere. Radio observations of the bottom of the atmosphere or on the planet's surface have given 405 degrees on one wavelength and 603 degrees on another.

It used to be that the Moon could be counted on for a couple of Beers. Future astronauts, however, will have to settle for only one. The reference is not to the sudsy beverage but to a crater, some eight miles across, which bears the name of a 19th century lunar expert, Wilhelm Beer, of Germany. The second Beer Crater was renamed when the International Astronomical Union undertook to standardize Moon nomenclature after World War I by eliminating duplication, ambiguities, and other confusion in feature names.

Beer is a noteworthy name in lunar studies. A Berlin banker by occupation, he built a private observatory at his home in the 1820s and, assisted by a friend, Dr. Johann Madler, devoted more than 10 years to a systematic survey of the Moon's visible face. They were the first to reach the conclusion that the Moon was a dead, empty world. They also published in 1838 a lunar atlas, *Der Mond,* which surpassed all previous works on the subject and is regarded as the century's masterpiece in that field.

Does a violent lunar "hot foot" await the first astronaut who steps out onto the surface of the Moon? Dr. John R. Platte, University of Chicago physicist, has reasons to think so. The very fine dust covering the surface of this natural satellite, he believes, should have excellent qualities for absorbing the electromagnetic radiation received from the Sun. Moon dust also would be extremely reactive chemically, he theorizes, even to the point of exploding at the slightest disturbance.

"The first man who plants a rubber boot on the lunar surface," his conclusion runs, "may be in for an unpleasant surprise." The idea is that it might be as unhealthy as kicking a large package of dynamite, well rigged with detonators to blast it off.

Microminiaturized moonlets: Saturn has them in uncountable numbers. They make up the girdling ring system which gives the planet its unique appearance.

Astronomers long believed that each of the three major rings which form the system was solid in its structure although they lacked any explanation to account for such an unusual phenomenon. The mystery persisted until little more than a century ago.

The theory that the rings were composed of innumerable small particles was first advanced by James Clerk Maxwell, a young Scot who was both a physicist and mathematician. His conclusions were set forth in a paper published in 1859 when he was only 28. He held that the divisions—or open spaces—separating the rings were due to the pull of perturbations caused by the gravitational attraction of Saturn's sizeable outer moons.

Confirmation of the hypothesis came in 1895 as the result of experimental studies by J. E. Keeler, an American astronomer. Using a spectroscope to analyze light emanating from the rings and applying the Doppler principle to compute variations in the light's velocity, Keeler determined that the rings' outer edges took a longer time to revolve with reference to the planet than the inner edges did.

Such disparity of motion could not exist in a solid formation. On the contrary, it was the reverse of normal behavior. The only tenable explanation for the rings was that they were composed of great swarms of tiny satellites, each one moving through its own midget orbit in accord with Kepler's laws governing the motion of celestial bodies. The total mass of the entire ring system has been estimated as less than 1/100th that of our Moon.

In size the particles are believed to range from pebbles and broken rocks to bits of dust somewhat coarser than flour. Although each orbits, the particles are so close together that they reflect sunlight, the degree of brightness varying with the ring.

The origin of the ring system has been much debated. There has been speculation the particles may be fragments of a "spoiled" planet which failed to solidify permanently or the debris of a satellite which "exploded" under the influence of some unidentified force.

According to the hypothesis known as Roche's Limit, a liquid satellite not separated from the center of its planet by more than 2.44

1st Lt. John D. Aragon, 55th Tactical Fighter Sq., demonstrates wearing and positioning of SARAH.

Flight with Sarah

by William R. Karsteter, *Hq, Third Air Force*

You're a Third Air Force pilot and you've just bailed out over the North Sea more than 50 miles from your base in Britain. You know you can't last too long in the bitter cold water.

Desperately you flop into the bottom of the little dinghy. You're weakening fast, but you manage to remove a gadget at your waist, clip it to the dinghy's side and pull the cords.

A huge gray fog bank is rolling in fast from the north. It's cold and miserable and your teeth chatter. Suddenly, the grayness comes, deepens to black, and you pass out.

You come out of it slowly. There's a beating, throbbing noise and you realize you're in a helicopter.

"How'd you find me?"

The RAF man grins. "SARAH showed us. We pulled you out with the hook." He jerks his head to indicate the winch.

As you curl up to conserve the warmth in your wet clothes, you thank God for SARAH. Developed in the Royal Air Force and named after its function—search and rescue and homing—SARAH is a complete radio transmitting station which Third Air Force pilots don along with parachute and life preserver whenever they fly. Flying at 10,000 feet, a rescue plane can home in on its wearer from 70 nautical miles away and a rescue ship can pick up its signals at a six-mile range. Worn by Third Air Force aircrews in a special belt, it is completely waterproof and, once switched on, transmits without stopping for 20 hours. A downed man has only to pull two cords to release a two-foot aerial and put the three-pound, battery- powered set into operation.

All Third Air Force units requiring it will soon be equipped with SARAH.

SLANTS *continued*

times the latter's radius would be torn to pieces by the planet's tidal attraction forces. It has been noted that all of Saturn's ring system lie within the Roche's Limit. Mimas, the nearest of Saturn's nine regular moons, orbits just beyond Roche's Limit.

Benjamin Franklin, himself a homespun scientist, is the best known American to have his name on the Moon. Honoring Poor Richard's memory is Franklin Crater, located in the northwest lunar quadrant to the west of *Lacus Somniorum* (Lake of Sleep or Dreams).

Occasionally, after separation from a payload device, the final stage of a rocket goes into orbit. In such cases does the last stage move in the same ellipse as the payload and at similar velocity? No. The process of separation imparts a "kick" to the payload which means that its ellipse pattern will be higher in terms of altitudes. Since the orbit of the final stage will be lower, its velocity will always be greater. The higher the altitude of a payload in orbit, the slower its orbital velocity. The lower the injection point, the faster the orbiting.

When the Moon is a thin crescent, the faint outline of the rest of the lunar disc can frequently be seen with the naked eye. This phenomenon has long been known as "the Old Moon in the Young Moon's arms." The brightly shining crescent gets its light from the sun, while the dim, shadowy portion owes it subdued illumination to Earthshine reflected by our own planet. When the phenomenon occurs, the Young Moon has the appearance of being part of a larger disc than the Old Moon. This optical illusion is explained by the fact that the brightly illuminated section of an object seems to have greater proportions than a poorly lit area of comparable size.

WILLIAM A. KINNEY

AIR ACADEMY CADET

a day in his life

WHEN ex-airman Richard Mrosla, 22, steps up to receive his bachelor of science degree, gold second lieutenant bars, and silver navigator wings at U. S. Air Force Academy graduation ceremonies next month he will realize a dream come true.

Four years ago the tall, blond-haired cadet was an A/2C stationed at Keesler AFB, Miss. An electronics instructor encouraged him to enter the new, sparkling Air Force Academy at Colorado Springs, Colo. He took the entrance exams, passed with flying colors, won a congressional appointment, and became a fourthclassman in July 1956.

Since then his fortunes have skyrocketed. After what he called a "spit, polish, and march" first year, his rise to firstclassman was rewarding. Now Mrosla is a Cadet captain, commands a flight, has kept up a four-year "B" average, plays on three intramural athletic teams, and is active in a half-dozen extracurricular clubs.

His day starts at 5:55 a.m. at "Aluminum U" (Cadets' nickname for their ultramodern academy) when he falls his flight into formation outside their sixth-floor rooms at Vandenberg Hall. It doesn't usually end until "lights out" at 11:15 p.m. Between these hours the young "falcon" attends classes in aerodynamics, Spanish, political science, and navigation; studies two hours in the library; attends noon formations; gives crisp orders to subordinates; writes Cadet effectiveness reports; plays intramural sports; and sometimes goes on navigational training flights.

The future career officer will graduate in June, take a one-month leave to get married before entering pilot training. After flight school he hopes to study for a master's degree in electrical engineering.

"The four years seem like a fleeting moment now that I'm about to graduate," said the soft-spoken Cadet, "and it was my experience as an airman that helped me during the difficult times."

STORY AND PHOTOS BY 1ST LT. BRIAN T. SHEEHAN, AIRMAN STAFF

Cadet captain Richard Mrosla is poised, ready for bright future.

Mrosla, roommate wake at 5:30 a.m., dress for day's activities.

Cadets eat breakfast in hangar-sized dining hall which can seat more than 3,000 men.

how to enter the air academy

EACH YEAR 45 of the 743 cadet vacancies at the U. S. Air Force Academy are reserved for Regular and Reserve enlisted members of the Air Force and Army. Airmen applying through this category must have completed one year of service by July 1 of the year in which they would be admitted to the Academy. They must apply through their unit commanders who will process applications and forward them to the Academy's Director of Admissions for eligibility determinations.

To be eligible for appointment, an airman must be unmarried, between 17 and 22 years of age, and a U. S. citizen. His physical condition must be good, and he must have a minimum 20/50 vision correctable to 20/20. He must be at least 5 feet 4 inches tall but not over 6 feet 6 inches.

Airmen, if qualified, can apply for Academy admission under more than one of the six categories. Interested airmen should write directly to their Representative and both of their Senators and express their desire to enter the Academy.

Upon graduation from the Air Academy, an individual is obligated to serve a four-year active-duty tour. Those who go into pilot training begin this tour after completing flying school.

Flight planning for navigational training missions is part of Academy life. Cadets receive full briefings.

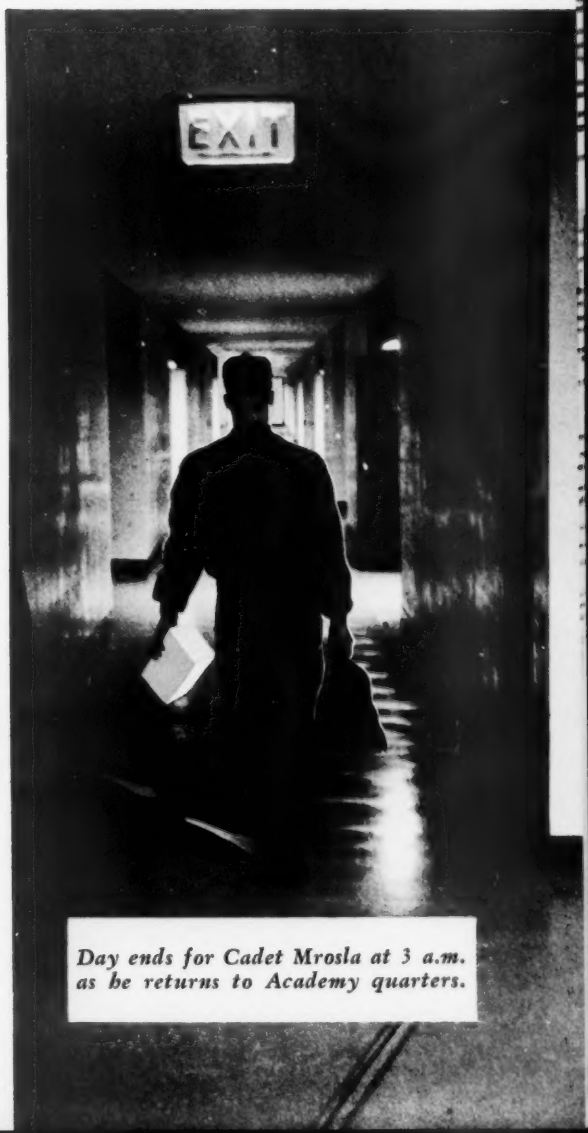
On night mission, Mrosla has his turn at navigating T-29 from Lowry AFB, Colo.

Volume-filled library serves as academic center for Cadets. Mrosla checks card catalog for term-paper bibliography.

Cadet Mrosla has afternoon chat with social director about upcoming dance.

Inspecting science lab wind tunnel are Cadet Mrosla and Maj. Jean Goppert, Asst. Aerodynamics professor.

Weary Cadets critique their mistakes after returning from four-hour navigation training flight.



Day ends for Cadet Mrosla at 3 a.m. as he returns to Academy quarters.

Space, missile, and safety programs are ahead of schedule thanks to the Air Force's

Railroad Track to the

A GLEAMING, 20,000-foot "railroad track to the future" at Edwards AFB, Calif., may help hurry the Air Force's first manned vehicle into outerspace, prove it can take the stress and strain of interplanetary travel, and possibly save its pilot if anything goes wrong.

That's the bright future predicted for a 3½-mile long "high-speed experimental track" belonging to ARDC's Air Force Flight Test Center. Right now the high-speed track is used to test aircraft escape systems, guided-missile components, aircraft skin surfaces, and missile-cone recovery parachutes.

But its future roles in gathering data for vehicles entering the space race is almost unlimited. Flight Test Center officials say it will be a vital link in discovering if man's spaceship will be able to withstand the menacing physical forces expected in outerspace.

The new experimental track, situated in a dusty, desolate valley 11 miles from the heart of Edwards, has already proved its worth in the aircraft-testing business. Everytime a Century Series fighter pilot faces an emergency he can be thankful his bailout gear—from parachute to survival equipment—was safely test-ejected from a rocket-powered sled that whizzed down the steel track some years previously.

But the track, capable of supporting sleds racing at Mach 4 speeds (four times the speed of sound), has a dozen different tasks and they're all aimed at learning more about subsonic, transonic, and supersonic flight through "captive flight testing."

Captive flight testing is simply testing aircraft and missile parts on the ground, instead of in the air. A rocket-powered sled is mounted on the silver track, with a component aircraft or missile part fitted to it. Sleds weighing 15,000 lbs. have been whizzed by rockets down the twin rails at 2,000 feet per second, and when they reach the 14,000-foot mark they streak into a shallow trough of water which stops them almost instantly. Scientific data gathered from this test method saves the Air Force thousands of dollars and much valuable time.

Sleds fitted to the track are powered by solid and liquid propellants. Most sleds are boosted down the track by solid rockets that burn in sequence until the sleds hit their incredible programed speeds. Now and then liquid propellants are used. One such sled quick-started down the track, developing 50,000 lbs. of thrust in 0.45 seconds.

Missile and aircraft components are among items regularly tested on the track. Staff of 90 officers, airmen, and civilians supervise daily test operations.

Plastic dummy (below) is blasted from sled whizzing down experimental track as part of ejection tests proving the safety of high-speed jet bailouts.

The ARDC facility, part of the Experimental Track Branch commanded by Maj. Donald W. Bowry at the Flight Test Center, is used by all Department of Defense agencies and subcontractors for test purposes. Ninety officers, airmen, and civilians are involved in track-testing operations and their work is exciting and dangerous. Fast and accurate test results are gathered by the track's three sections—operations, engineering, and instrumentation.

Recently the Air Force conducted advanced studies on the dual ejection system of the F-106 *Delta Dart*. First, the test sled's design requirements, aerodynamic drag curves, and power supply were defined. Then an F-106 cockpit was placed on the sled while electronic telemetering and data-reduction equipment was jammed into the chest cavities of two plastic dummies.

Meanwhile photographic coverage of the high-speed test ejection was arranged by the photography branch of the Technical Support Division. Trackside cameras, capable of taking 29,000 picture frames a second, were mounted at 100-yard intervals near the track while sled-borne cameras were set up to record events which took place inside the sled and dummies. A helicopter was scheduled to hover 500 feet over the test track so aerial photographers could capture the test run from a high angle.

On the test day, the solid-propellant crew wired the last ignitors to the rockets' complex firing system a few minutes before the one-minute siren warning was sounded.

When the range safety officer punched the "launch" button at zero hour the rockets exploded with a roar, sending the F-106 sled hurtling down the 20,000-foot track. Nearby joshua trees, landmarks of California's Mojave Desert, swayed in the rockets' blast. Tumbleweeds were rolled crazily across the desert floor by the same force.

At the 8,000-foot mark the canopy blew off the F-106 and an instant later the two plastic dummies were blasted into the air. They tumbled end over end through space and then their parachutes blossomed. They floated gently back to earth.

After an ammunition demolition team made sure no unexploded rockets were still "alive" in the sled nearby camera crews rushed to where the dummies fell and photographed their landing positions. This would later substantiate technical test reports written by track branch engineers.

Missile nose-cone test (left) on 20,000-foot high-speed experimental track is typical of tests which have rocketed the Air Force ahead in development.

Instrumentation expert wires computer equipment into sled prior to test at Edwards Flight Center.

The first high-speed track at Edwards (there is another 35,000-foot track at Holloman AFB) built by an aircraft corporation in 1949, was taken over by the Air Force in 1950 when Muroc Lake was turned into the Air Force Flight Test Center's new home. That was when SMSgt. George Faneuf reported there to work with the special high-speed track. Now, 10 years later, Sergeant Faneuf is still at Edwards, but as assistant chief of operations. He has grown up with the high-speed track business.

"Our problems have changed considerably since we first started track-test work," said the veteran of 19 years' Air Force experience. "Back in those early days we only had a beat-up 10,000-foot track, and all this land around here used to be open range." He recalled having to chase cows off the track prior to almost every test.

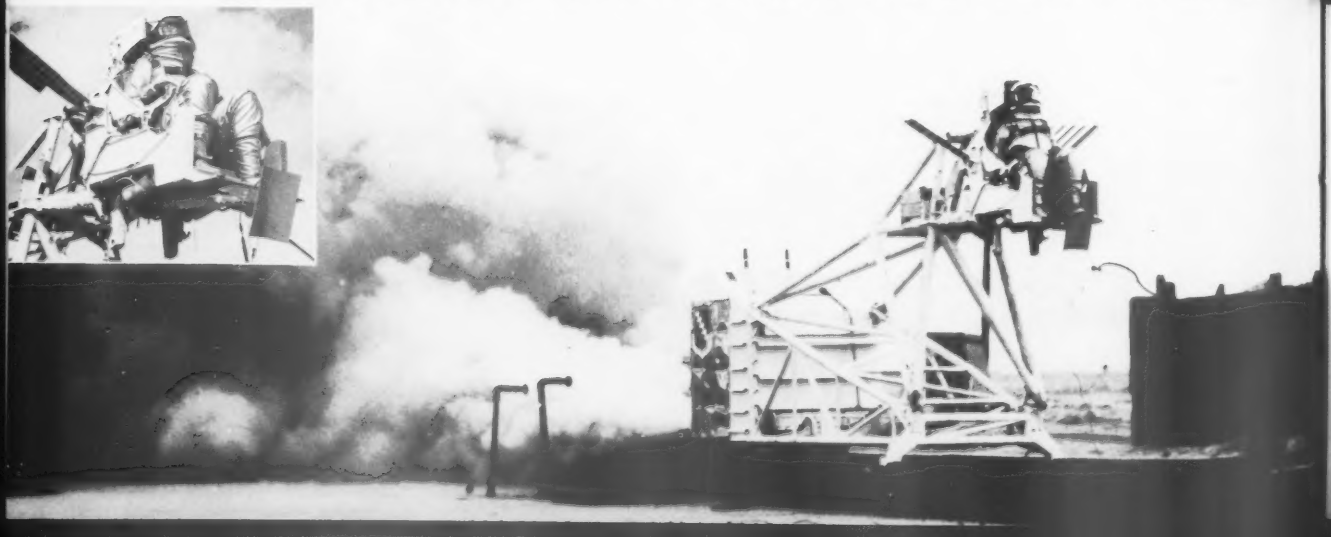
Today, however, an average of 15 "shots" a month take place on the narrow-gauge track, and you'll find everything from guided-missile nose cones to F-107 configurations riding its supersonic sleds. Flutter tests on aircraft horizontal and vertical stabilizers are frequent. So are rain erosion tests and tests to check the strength of parachutes opened at supersonic speeds.

The high-speed track will become more important to research and development as the Air Force tests new components for outerspace vehicles, ballistic missiles, and satellites. Testing like this took place recently when component parts of the Air Force's X-15 rocket plane were exposed to shattering endurance tests on the high-speed track. The X-15 empennage was checked for "flutter," and many of its internal parts were subjected to Mach 3 speeds as part of their "environmental control" testing. The rocket plane's first test pilot, Scott Crossfield, was at the track daily to study the X-15's emergency escape system.

Such tests were instrumental in insuring that the X-15's first test glide and subsequent flights were successful. When confronted with this fact track scientists and engineers shrug their shoulders and say, "That's our job." But among themselves, and unknown to anyone else, they have a secret motto. It reads: "Get on the team or get off the track."

1ST LT. BRIAN T. SHEEHAN, *Airman Staff*

Windblast test on equipment for X-15 pilot was held in April, 1958. Flight suit was exposed to Mach 2 speeds.

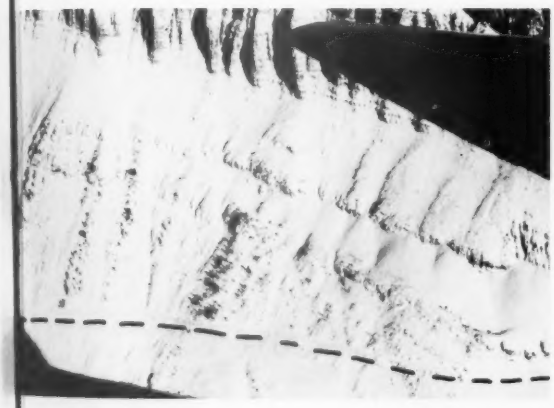


A GOOD BOOM

Arrows indicate almost perpendicular natural avalanche chute where snow accumulations threaten Glacier National Park's road-opening crews on the snow-buried road (dotted line) at bottom of photo.

by Helen S. Peyton, *Airman Staff*

Two supersonic "mountain dusters" made a "first" in the pages of aviation and scientific history on February 1, 1960. Leading the unique two-aircraft mission was Col. James K. Dowling, Deputy Commander of Geiger Field's 4700th Air Defense Wing. His wingman, Lt. Col. Frederick D. Ellis, commands Geiger's F-106-equipped 498th Fighter Interceptor Squadron. They used heretofore useless sonic booms to bring down a dozen snow avalanches in Glacier National Park, Mont., with nine mach-busting, low-level passes.



Dotted line indicates Going-to-the-Sun road where destructive avalanches threaten lives and equipment of Glacier National Park's road-clearing crews each spring.

The F-106 *Delta Dart* recently won the world's speed record of 1,525 m.p.h., more than twice the speed of sound.

Named *Operation Safe Slide*, the plan was conceived by Glacier National Park officials two years ago as a possible jet-age solution to the ageless problem which plagues engineers at Glacier and similar avalanche areas throughout the world. The park superintendent, Edward A. Hummel, suggested the Air Force consider the idea. When the USAF Deputy Chief of Staff, General Curtis E. LeMay said, "Try it!" *Operation Safe Slide* was born.

The F-106 *Delta Darts* will deliver more aimed and controlled supersonic booms on the park's avalanche-threatened areas. Each year the "Safe Slide" plan can prevent dangerous snow accumulations by periodic "dusting" with sonic shock waves, from January through April, before annual road-opening operations begin.

Glacier Park lost lives and equipment to accidental avalanches during past road-clearing operations. Snow removal crews had been injured and buried alive by accidental avalanches. Dynamite charges and artillery shellfire had been tried to trigger the avalanches but had proven largely ineffective.

Prime target of the jet-age project was the famous Garden Wall Gorge of Montana's Glacier National Park. Its almost sheer perpendicular walls constitute natural avalanche chutes which annually accumulate snow drifts 75 to 90 feet deep. The 50-mile long Going-to-the-Sun road cuts into the side of Garden Wall Gorge, linking the east and west sides of the park.

Normally, sonic booms have such a weak pressure force they seldom do more than rattle a few windows and startle people. At "on the deck" altitudes, however, a controlled and aimed sonic wave can deliver a sharp shock force more than triple the weight of normal air pressure. While such a force (up to 33 pounds per square foot above normal atmospheric pressure) is still less than half that necessary to damage flimsy structures, it is sufficient to dislodge snow buildups in areas where avalanches are sometimes started by a rifle shot.

Glacier Park authorities have accepted responsibility for any damage to park facilities as a result of the project.

The results of the historic mission were observed by the Montana park's chief engineer, Max A. Edgar. He stated: "This appears to be the best solution yet to the avalanche menace. The snow we moved had been set and stabilized by recent thaws. Sonic booms should prove even more effective against fresh and loose snowdrifts."

Thus it appears that the jet-age phenomena of the sonic boom has been put to useful work, and that "mountain dusting" will become another regular service performed by the Air Defense Command.

DATE OF RANK

Sir: I have a problem which is no longer unique and I would like an explanation. I transferred from another branch of service, without a break, but was forced to take a date of rank from the day I enlisted in USAF, thus blocking me from competing for promotion until after an extended period in this service. I think this is unfair to transferees.

TSgt. Gordon Scott
APO 12, New York, N. Y.

● *Officials in the Airman Promotion Branch, DCS/Personnel, Hq USAF, indicate that this problem has been given extensive study. They felt adoption of a policy which would carry over date of rank from a former service would create a major morale problem for personnel who have spent their entire career in USAF. The conclusion is that persons who devote their careers to one service should be given first consideration when aligned with others who have transferred in from other branches.*

★ ★ ★

FLYING STATUS

Sir: Promotion to the new supergrades has created a problem for many personnel, but most specifically, the 43174s, Flight Engineer Technicians. In many cases, such promotion has meant loss of flying status and a corresponding loss of flying pay. Consequently, these men face the problem of being promoted only to suffer a major pay cut because of that promotion. Has USAF established any policy regarding this situation?

Name Withheld

● *This query was discussed quite extensively with officials in personnel and manpower at Hq USAF. According to them, the general policy is that supergrade positions have been created primarily as supervisory slots which do not normally entail flying duties.*

However, there are some aircrew positions, such as standardization and flight testing, which have been elevated to the new status. The decision on these was reached after a thorough analysis of individual position requirements in accordance with the provisions contained in AFM 35-2.

It is true, and headquarters is aware, that some people continue to fly after they have been promoted to E-8 or E-9 even though they are not in an authorized slot. This has been temporarily sanctioned because replacements are not always immediately available to fill vacancies created by promotions. However, the waiver for such participation is limited to 120 days. The positions for which this action was authorized, and several other relevant details, are contained in an all major commands message dispatched from Hq USAF, last year. It amended paragraph 6, chapter 5, AFM 35-13.

Personnel officials are aware that supergrade promotions in this area can create a problem because of a decreasing percentage of authorized flying spots. However, they point out that this is generally true even at lower grades. For example, there are more flying slots authorized for techs than for masters. They also indicate that personnel who are promoted, and who stand to lose flying pay because of such promotions, have the alternative of requesting administrative demotion to their former grade within 60 days after promotion action in accordance with the provisions contained in AFR 39-30. Understandably, they do not recommend such action. Although it may be financially expedient at the moment, it could have rather long-range effects when reduced retirement pay is taken into consideration.

IN SUPPORT OF MERCURY

Here is what USAF's support of *Project Mercury* involves, as of this writing:

★ Providing 13 *Atlas* boosters.

★ Providing booster launch officials and crews to assist NASA on ballistic and orbital launches of the *Atlas* booster.

★ Assisting in the preparation of *Mercury* launch operations plans at the Atlantic Missile Range.

★ Establishing a *Mercury* planning office with the responsibility for preparation and coordination of DOD's *Mercury* support plans.

★ Providing launch pads and hangar area for booster and *Mercury* orbital capsule.

★ Providing space for NASA data collection equipment.

★ Collection of data utilizing USAF and NASA equipment.

★ Operation of NASA data-collecting equipment at stations in the Atlantic Ocean, continent of Africa and the Indian Ocean.

★ Providing operational coordination for a NASA-operated station at Bermuda.

★ Assisting in the planning for *Mercury* data collection by USAF facilities in the Pacific Ocean area.

★ Providing assistance in capsule recovery planning.

★ Providing rescue service as outlined in the *Mercury* recovery plan.

★ Providing on-call or scheduled air passenger and cargo-carrier services in accordance with established procedures.

★ Providing laboratory animals for phases of the biomedical test program.

★ Providing wind tunnel test facilities at the Arnold Engineering Development Center, Tenn.

★ Providing astronaut training and consultation at the USAF School of Aviation Medicine, San Antonio, Tex., and the Wright Air Development Center, Ohio.

★ Providing maps and charts for the navigation phase of the *Mercury* program.

★ Providing aircraft for test drops of the *Mercury* capsule.

★ Providing aircraft for proficiency crew training of the astronauts.

AIRMAN'S WORLD

TAKE-OFF OF THE *HUSTLER*—a sight that will become more and more familiar in the airman's world of the immediate future as the B-58 is introduced into operational inventories. The 43rd Bomb Wing, first to be equipped with the double-Mach bomber, began moving into Carswell AFB, Tex., in March. The newest retaliatory weapon promises a greatly increased capability for USAF, in range, speed, and payload and, teamed with SAC's ICBMs, provides a formidable mixed system.

PEOPLE—Community relations

EVENTS—Self-starter

BOOKS—*The Longest Day*

PANORAMA—May flowers

People

WHO MADE NEWS THIS MONTH

Increasing USAF participation in community endeavors is reflected in several awards to Air Force people during recent weeks.

Honorary citizenship was bestowed upon SSgt. Gus Bontivegna and fellow members of his Installations Squadron by residents of the city of Zaragoza, Spain. The group was cited for their humanity in the tragic Andres Cuello story. (Page 23, Nov. '59 issue.) The Ebro Valley city distinction has been awarded to only one other American.

In Spokane, Wash., Col. Leon Gray, commander of the 4700th Air Defense Wing at Geiger Field, was named the city's "Military Man of the Year" in recognition of his military achievements and outstanding contributions to Air Force-community relations.

The highest award that can be conferred by a British troop on a non-scout was presented to MSgt. Eugene Dyer of RAF Station Bentwaters-Woodbridge by the 1st Carlton Colville scouts of Lowestoft, England. The "Thanks Award" was for Sergeant Dyer's role as liaison officer between the English troop and American scouts at the local air base.

British officials also cited two other USAF members of the same community for their part in saving the lives of an Ipswich couple from the flaming wreckage of their overturned auto. MSgt. Darrell Goldson and SSgt. Daniel Barr, both of the 1264th AACS Squadron, were honored for their "quick action and valor" and received certificates from the British Society for the Protection of Life from Fire at the Woodbridge Magistrate's Court.

Finally, in Japan, Mayor Kiyoshi Nakarai of Yokohama expressed his thanks, on behalf of the local citizenry, for the heroic action of SSgt. Harry Heady, 6000th Installations Squadron, Fuchu AS, Japan. When an explosion ripped through a munitions factory, Sergeant Heady, as chief of the local USAF fire department, rushed to the scene and was instrumental in saving several people from the inferno.

★ ★ ★

A tip of THE AIRMAN'S hat goes to Grace Peterson, McGuire AFB, N. J. The first of next month, Sergeant Peterson assumes the role of Chief Master Sergeant—USAF's lone WAF at that level.

★ ★ ★

In the category of unique clubs, Nellis AFB, Nev., reports the formation of a novel organization. Eighteen local airmen have founded the Nellis Fast Draw Club—dubbed the "Marked Aces"—devoted to the art of preserving the fast draw and fostering proper handling of six-guns. Fastest time to date was posted by TSgt. Samuel Rogers—.19 of a second to draw and fire.

★ ★ ★

Two Geiger Field, Wash., airmen recently received Soldier's Medals for their action in saving three highway accident victims from a flaming death. TSgt. John Cox and A/1C Shannon Winingear happened upon the scene of a station wagon-pickup truck collision just as the wreckage erupted in flames. Disregarding their own safety, the two airmen dashed into the spreading fire, freed the stunned driver of the truck, then smashed out the windshield of the car and dragged the trapped and unconscious occupants of that vehicle to safety. Washington State Police were quick to point out that only the quick action of these two men prevented a multiple tragedy.

★ ★ ★

Young Timothy Dalbec, son of SSgt. Paul Dalbec, Dover AFB, Del., is an excellent advertisement for the value of polio immunization. Medical officers continue to urge the completion of the polio series by airmen and their dependents. Children may normally begin the series at age three months.

Events

THAT REFLECT AIR FORCE PROGRESS

At Holloman AFB, N. Mex., submerged dummies are being used in tests to determine if a water-cushion eases deceleration shock. The dummy is loaded into a special capsule which is filled with liquid, sealed, fired down a six-plus-mile track, and jolted to a crushing 40-G stop. Results of tests will be fitted into the maze of data being collected for the man-in-space project.

★ ★ ★

Explosive cartridge self-starters, similar to those used on B-57s, are being tested on operational F-100s. Success of the method will eliminate use of external power sources and save precious minutes during alerts. Additionally, it will banish the costly need to transport power units and ground crewmen to pilots forced to set down at strips where such equipment and personnel are not available.

★ ★ ★

Reese AFB, Tex., is playing host to one of the most cosmopolitan classes ever to undertake pilot training there. Included are a German officer and seven German cadets, two flying candidates from Ethiopia, 28 United States Aviation Cadets, and five members of the USAFA class of '59. The Ethiopians represent the 26th foreign country which has sent students to Reese for flight training.

An aerial survey team of the 1370th Photo Mapping Wing of Turner AFB, Ga., began operating in South America last month. Comprised of 160 men, six aircraft, and allied equipment, the team is based in British Guiana and will photomap areas of that country, Venezuela, Surinam (formerly Dutch Guiana), French Guiana, and Brazil. The project is expected to take approximately six months.

★ ★ ★

USAF's only stateside-based helicopter squadron was recently deactivated. Operational since 1955, the 20th Helicopter Squadron logged more than 17,000 hours during its lifetime in a variety of missions which included Arctic airlift, drone target recovery, rescue, and photomapping.

★ ★ ★

Of nearly six million GI insurance policy holders, only about 850,000 will not share in the 1960 dividend windfall. VA has announced that this latter group includes about 680,000 Korean and post-Korean veterans whose policy numbers bear the prefix "RS," "W," or "RH"; 100,000 whose "V" and "K" policies are under in-service premium payment waivers; 60,000 who have allowed their permanent-plan policies to lapse; and 7,000 whose policies bear the prefix "H."

BRIEFS

. . . Airmen at Lowry AFB, Colo., established what they believe to be some sort of a record when they answered an emergency call from Rapid City recently. Twenty-four vials of serum to counteract Botulism, a fatal food poisoning, were delivered to the South Dakota city one hour and 34 minutes after the call was received.

. . . Officials at Chanute AFB, Ill., have announced the arrival of the first complete *Hound Dog* air-to-surface missile. As a result, two additional courses have been established at the GAM-77 school—Electronic Control System Analyst and Missile Technician.

. . . California houseflies and South Texas honeybees are arriving in Dallas, Tex., by the thousands. The aim—to help solve the problem of removing bugs from windshields of low-flying aircraft, a hazard that seriously distorts pilot vision during the landing operations.

. . . Technicians at the Air Force Missile Development Center, N. Mex., are claiming a mission record for a USAF X-7 which has been fired and recovered no less than 11 times. The special pet has earned the nickname "Old Boomerang."

USAF'S Q-2C *Firebee* jet target missile is being phased into Air Force operations. Faster and more advanced than drone targets presently in use, the tiny bird will produce a more realistic challenge for testing the combat readiness of pilots, planes, and ground radar crews.

Panorama

Our Airminded Ancestors

"My children in their lifetime will see aeronautics become the greatest and principal means of national defense and rapid transportation all over the world and possibly beyond our world and into interstellar space."

GEN. WILLIAM MITCHELL (1930)

WITH SNOW-CAPPED FUJIYAMA providing the backdrop, this Lockheed C-130 *Hercules* signals its arrival in PACAF. With missile-carrying capability and increased speed, the C-130 is yet another link in the strong capability chain which USAF has woven. This excellent study illustrates the global mobility of USAF and the fact that foreign check points, such as this famous Japanese landmark, have become integral parts of the airman's world.

★ ★ ★

LOOKING LIKE A MAY FLOWER, the speed brakes of the F-105 provide a study in progress. All four petals are designed to open in flight to ease handling of the 1,400-m.p.h. jet during aerial maneuvers, while only the top three are utilized for landings. The newest Republic contribution to the Air Force stable provides a nice deterrent balance when coupled with bombardment aircraft and a varied missile family.

For Professional Airmen

True Air Force professionals are constantly aware of the latest publications affecting them, their jobs, and USAF in general. Air Force Manuals are among those universally important publications constantly being revised in the light of rapidly changing requirements.

Particularly significant to airmen is the recently changed and highly important AFM 1-2, *USAF Basic Doctrine*. This is a pamphlet everyone should review periodically, especially when it is revised.

Others which have special significance and have recently become available in new form are Change A to AFM 32-3, *Accident Prevention Handbook;* revised issues of AFM 35-1, *Airman Classification Manual;* Change B to AFM 110-8, *Military Justice Code;* and the changes numbered 60 and above to AFM 173-20, *Pay and Allowances of Officers and Airmen.*

Aerospace Library

Students of aerial history should have more than passing interest in many of the books which have been issued in recent months.

From WW I, *Air Aces of the 1914-1918 War* is an excellent contribution. Edited by Bruce Robertson, it features the exploits of aces from eight nations. Harleyford, England. $8.50.

William Green has another entry in his series entitled *Famous Bombers of the Second World War*. As did his earlier work on fighters, some of the featured aircraft are bound to stir memories for veteran airmen. $3.95, by Hanover House.

Cornelius Ryan's *The Longest Day: D-Day —June 6, 1944* presents a dramatic re-creation of the first 24 hours of the Normandy invasion. Simon and Shuster at $4.95.

The area of missiles and space continues to fascinate writers and publishers. *Fundamentals of Guided Missiles*, is a reprint of an Air Force training manual. Aero Publishers, Inc., at $12.50.

Space Technology and *The Exploration of Space* are also among the latest works in this field. The former was edited by Howard Seifert, released by Wiley, and priced at $22.50. The latter is a revised version of the earlier work by Arthur Clarke. Harper, $4.50.

All aircrewmen should read *The Survival Book*. A coordinated effort of Dr. Paul Nesbitt, Alonzo Pond and William Allen, it covers survival techniques and tactics for nearly every climate. Van Nostrand, $7.50.

Finally, teen interest should be piqued by a number of recent books written especially for them. Among these is *Sabre Jet Ace*, the story of Capt. Joseph McConnell, Jr., by Charles Coombs. Wheeler, $2.20.

Other interesting titles include *Sky Sentry: A SAC Crewman in Service*, Arnold Brophy, (Dodd, Mead, $2.75); *General Billy Mitchell*, Helen Woodward, (Duell, Sloan, and Pearce, $3.50); *Wings for Peace*, Marian Talmadge and Iris Gilmore, (Dodd, Mead, $3.00); *Men, Planets and Stars*, Clyde Clason, (Putnam, $2.95); *Our Space Age Jets*, C. B. Colby, (Coward-McCann, $2.00); *Falcons to the Fight*, Joe Archibald, (Macrae Smith, $2.95); and *New Dimension of Flight*, Lewis Zarem, (Dutton, $3.95).

You Ask It

Q. Could you please explain the difference between compensation and pension in VA terminology?

A. Compensation is payable to eligible veterans whose disabilities are *due* to service. Pensions are payable only to eligible veterans whose total and permanent disabilities are *not due* to service.

Q. Can you tell me if it is necessary for an individual to personally insure his household goods while they are in transit?

A. This is a decision the individual must make. Household goods van carriers are liable for a maximum of 30 cents a pound and a total of $6,500. However, if the goods being shipped contain articles of extraordinary value or exceed authorized weight allowances, additional coverage is often desirable.

Q. How long have SAC units been operating under the "runway alert" concept?

A. This concept was initiated in October 1957 in an effort to reduce "reaction time." The ultimate goal is to have one third of their force on alert and capable of being airborne in 15 minutes. This is a program to increase our deterrent capability.

Q. Is there any legal penalty for the practice of issuing post-dated checks?

A. As far as we can determine, the practice is not illegal. However, it is an extremely poor one as many things can happen between the date a check is issued and that on which it is intended to be cashed. The best policy is never to issue a check unless you have the funds on hand to cover it.

Q. Is there any provision in regulations protecting Medal of Honor recipients from future combat assignments?

A. Yes. AFR 35-30 specifies that such persons will not be assigned to duties involving combat. It also provides that they may be separated from the service upon their own request.

Q. I will be discharged this summer and intend to enter college this fall under the Korean GI Bill. If I take a part-time job, will I have to report these earnings to the VA?

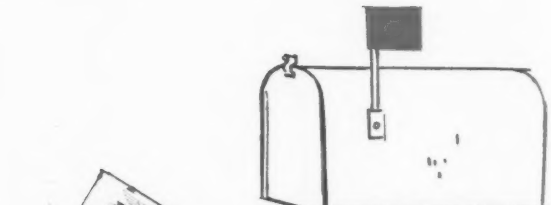
A. No. Such earnings do not have to be reported and they do not affect allowance checks.

Q. I understand navigators can now apply for pilot training. What is the authority?

A. An all-commands message was dispatched from Hq USAF in mid-February containing the pertinent information on this revised program.

AS CLOSE AS YOUR MAILBOX

by Dave Karten, *Airman Staff*



ECI, Air University's "do-it-yourself" correspondence program, enables officers and airmen to satisfy voluntarily many of their individual training needs.

Every day, at Air Force bases around the globe, some 300,000 airmen, ranging in rank from airman third class to colonel, open paperbound ECI textbooks to study during off-duty hours.

The school they attend by "do-it-yourself" study is the USAF's Extension Course Institute, an agency of the Air University. Its mission: to provide Air Force personnel with professional and vocational military education through correspondence courses. The curriculum: general military subjects and Air Force specialty fields which follow the AFSC structure.

Who are these iron-willed Air Force students who study in their spare time instead of succumbing to the natural preference to watch TV? They are one out of every four airmen in the Air Force. ECI's student body is made up of active-duty airmen (the majority) and officers, reservists, CAP members, and an ever-growing number of Air Force civilians. To all these people the institute offers an opportunity for education and training by correspondence without tuition or fees. Through a purely voluntary program, the Extension Course Institute gives a prospective student a choice of courses that may help him advance in his present specialty or, if he can qualify, cross-train into another one.

Just how does USAF's home-study program do all this? SSgt. Philip K. Robles, an ECI student stationed at Tinker AFB, Okla., answers the question: "ECI correspondence courses have enriched my knowledge of my particular career field not only by providing technical data, but also by giving the broad picture and history of a subject that regulations don't ordinarily provide. The time allotted for course completion is generous and the method of study is especially suited for military personnel—no geographical limitations, no rigid classroom hours, and within limitations, the time required to complete a course is solely dependent upon the time available to and the desires of the student."

What type of airmen are taking advantage of ECI home-study courses? They run the gamut of every type in the Air Force today.

The common denominator? An unquenchable urge for self-improvement and professional success in their Air Force careers.

A U. S. Senator who holds a commission in the USAF Reserve takes the courses to keep up with his Air Force "homework."

A member of a SAC crew, slated to become a squadron commander, lacks preparatory education in command and staff procedures. Because his unit's 'round-the-clock mission precludes extended absence for attendance at a resident school, he is taking the Squadron Officer School correspondence course to help him prepare for the command position.

An administrative clerk studies "Fundamentals of Electronics" to help him determine whether he has sufficient interest in and aptitude for this new specialty. If he has, both he and the Air Force stand to benefit from the cross-training by correspondence.

And a civilian at an Air Materiel Command supply depot that is converting to mechanical data processing,

prepares himself for the changeover with the help of an ECI course.

Multiply these examples by thousands of other burners of the midnight oil and you get a picture of how USAF's Extension Course Institute is helping Air Force military and civilian personnel meet educational training needs through home study.

At Torrejon AB, Spain, analysis of tests results showed none of those who failed airman proficiency tests—and more recently E-8 exams—was participating in extension courses. On the other hand, 75 percent of those who passed were taking or had taken correspondence courses related to their job areas.

Other tests at March AFB, Calif., showed none of the 17 airmen who failed his upgrading test was taking ECI courses related to his assigned field. But of 55 airmen selected at random among those who passed the test, 22 were taking or had completed ECI courses pertaining to their career fields. One airman summed up the feelings of all 22: "Studying the two-volume course 6812 (Statistical Analysis, Data Processing, and Programming) not only freshened my outlook in my career field, but enhanced my potential in the related field of stat services. I know of no better way to gain technical knowledge than through ECI study."

ECI offers one of the two major types of military correspondence education available to Air Force personnel today. The United States Armed Forces Institute at Madison, Wisc., (USAFI) is the other. Programs of both institutes are complementary. While ECI's military subjects satisfy specific Air Force educational requirements, USAFI's academic subjects provide essential background knowledge and general courses paralleling those offered in civilian schools and colleges.

Since 1950

Both institutes were created after WW II in response to specific needs. Shortly after achieving autonomy in Sept. 1947, the U. S. Air Force developed its peacetime training programs based upon resident schools, on-the-job training, and correspondence courses. Realizing that the overriding business of maintaining combat-ready units would preclude large numbers of airmen from attending resident training, Continental Air Command set up six separate extension course schools. They were consolidated a year later with headquarters at Offutt AFB, Nebr., then at Fort Benjamin Harrison, Ind. Course materials were borrowed manuals on general military subjects. The students were mostly Reserve officers.

In 1950 ECI was born. The extension course program was transferred from ConAC to the Air University and the school set up at Gunter AFB, Ala., across town from Maxwell AFB, home of the Air University.

One out of every four airmen in the Air Force today is enrolled in an ECI course.

Just 10 years ago ECI had 25,000 enrollees and offered 14 courses. In the past decade the curriculum has multiplied by eight; the student body more than 12 times.

Today ECI has 114 correspondence courses based on instruction given at USAF resident schools. The current curriculum offers five general military education courses which stress leadership, management, and a broad understanding of the workings of the Air Force and its place in the world. These courses, aimed at all levels from airmen to colonel, reflect the Air Force's desire for well-rounded leadership. They include: Officer Candidate School, Squadron Officer School, Command and Staff School, Air War College, and Leadership and Personnel Management for Airmen. In addition, ECI provides 109 specialized courses covering almost every AFSC. The specialized courses are listed by career areas. For example, there is no ECI course on aircraft jet engines per se, or any part or aspect thereof; rather there is a six-volume course entitled *Aircraft Jet Engine Mechanic*. The difference is more than one of title. Most ECI specialized courses instruct a man about a whole job—equipment, techniques, procedures, and whatever special administrative or management knowledge is necessary for performance of the job.

Many of the specialized courses are listed in the *USAF Training Prospectus*. This means they fulfill the formal training requirements for an AFSC.

"When USAF's Pentagon communications personnel were selected to field-test new communications equipment," said TSgt. Richard M. Waytko, training NCOIC, "ECI's Communications Center Specialist course provided needed training that was unavailable locally."

You and ECI

Upon the completion of a course, an entry to that effect is made in your records. And completion of an ECI course doesn't prevent you from attending a resident course at a later date when the opportunity arises. On the contrary, it increases your chances by providing a better background for the resident course.

While home study admittedly lacks some of the advantages of resident schooling, such as contact with other students and the instructor, the voluntary nature of correspondence study has these advantages: you may select the courses that satisfy your needs; proceed as rapidly as you care to, within limits; and pursue those ideas which interest you by reading the material listed in the course bibliography.

Completion of any course should present no problem. You are not on a rigid schedule. Examinations are all "open-book." You research your answers from the volume you are studying and its bibliography and record them on your answer sheet. Educators agree this method of learning is one of the best.

All of these benefits through correspondence study are offered without cost to you. Postage-paid envelopes are provided for transmittal of your lessons. At the successful completion of your course, you receive a certificate of completion for your 201 file and a diploma for your files.

Experience over the last 10 years has demonstrated that the generally accepted limitations of correspondence study are not valid. Today, most military correspondence courses are of a technical or semi-technical nature. Commercial correspondence schools teach hundreds of highly technical skills ranging from advanced electronics to master watchmaking. One fourth of all the certified public accountants in the U. S. have qualified through home-study courses. Recognizing the adaptability and effectiveness of ECI home study, major air commands are strongly encouraging their personnel to participate in a continuing program of home study.

Group Study

To add interest to ECI "do-it-yourself" study some bases have instituted group study to enable several airmen to take the same course at the same time. Group study offers one of the main advantages of resident school training: an opportunity to discuss problems and exchange ideas. The Extension Course Institute encourages group study but requires enrollment on an individual basis.

It works like this: a leader organizes a group of airmen to take a certain course. Each airman in the group then makes out his own application and must personally meet all eligibility requirements. The group leader then collects all the applications, has them approved by the education services officer, and mails them in one envelope. If the group leader or monitor doesn't enroll in the course, he may request a set of course materials for his own use. When ECI receives all the applications at the same time, it processes them simultaneously so that all airmen in the group receive their course materials about the same time. However,

the institute handles enrollment on an individual basis, keeps individual records, and mails study materials separately to each enrollee.

Study groups are on their own as to how they go about studying. ECI instructors handle correspondence from group leaders concerning problems specifically connected with a course just as they would from individual students.

The Examination

An "open-book" exam must be completed for each volume of a course studied and this examination does much more than merely "examine." It also serves as a teaching device and learning aid. This type exam is valuable because it gives the student an opportunity for self-testing, for restudying imperfectly understood areas, and for acquiring different slants toward and applications of principles learned. While the order of questions is scrambled to prevent easy reference without thorough prior study of the volume, the "open-book" examination serves as a study guide by pointing up the more significant areas and aspects of the text. It also provides a means whereby ECI and its course writers can locate text areas in need of improvement.

All ECI courses undergo constant revision. In this way students are assured the instruction they undertake on a "do-it-yourself" basis is current and valuable.

Who May Enroll and How

To be eligible for an ECI course you must be in one of the following military or civilian categories: a member of the USAF, Army, Navy, Marine Corps, Air National Guard, or CAP; Air personnel of MAAG or foreign mission countries; a Department of the Air Force civilian employee; or a member of the Air Force Reserve not on active duty.

Other eligibility requirements depend, naturally, on the course itself. Special eligibility requirements, if any, are listed in the ECI catalog.

You begin by filling out an application form available at your base education services office or writing to the Extension Course Institute, Gunter AFB, Ala.

After You Enroll, What?

After you enroll in a course, here is what happens: ECI receives your application, checks your eligibility for the course, and forwards your application for electronic data processing. Where formerly punched cards were used for record keeping and statistical purposes, enrollment data is now "miniaturized" on magnetic tape for use in the Univac system. This is the yellow "grade card" you receive with each examination. Listed on the card will be your service number, grade, name, the course number, and the volume number corresponding to the examination.

When you submit your examination answer sheet to the institute, you return this card with it, recording any changes in your status. This is important since failure to keep ECI informed of your address may result in cancellation of your enrollment.

Once you are enrolled, ECI automatically sends you the first two pamphlets of a course. Accompanying each pamphlet or volume is an examination or answer sheet. As soon as you complete one exam and return your answer sheet, you receive another pamphlet. This cycle repeats itself until you complete all volumes of the course. Thus you always have some study materials in your possession as you progress through the course.

A grade of 70 or more on examinations is passing. If a student fails on the first attempt, his answer sheet is not returned and he is given one more try. If he passes on the second attempt, he is given the minimum passing score of 70, no matter how high his score. To pass an ECI course you must have an average grade of 70 or better for all examinations and retakes. When you fail an exam and retake it, the first attempt is not figured in the average. The retake is what counts, whether it is passing or failing, and whether, if it is failing, the grade is higher or lower than that of the first attempt.

Examination grading isn't done by machines. An instructor gives his personal attention to every student's examination. Besides grading papers, the instructors, in a sense, take the place of classroom teachers by establishing personal contact between the institute and students. Your instructor's name is stamped on the first answer sheet and when you write for an explanation of a point in the text or for justification of the answer to an examination question, he prepares a reply. The instructor may confer with an ECI course materials or test construction specialist and in some cases bring the question to the attention of the preparing agency so that it is reflected in future text or exam revisions.

"ECI is a service organization," points out Lt. Col. Wilfred W. Wagner, the Extension Course Institute Commandant. "Since the objective is to increase individual proficiency, ECI courses are designed to disseminate information in a manner that will be readily assimilated by the student. We think of our examinations as instructional aids rather than rating instruments. We have only one purpose—to assist the Air Force individual in self-improvement. Since the program is voluntary, the size and composition of our student body is evidence of the extent to which we have achieved our goal of helping those who wish to help themselves."

What can ECI mean to you in the way of increased opportunities for self-improvement and advancement? Thousands of airmen have learned that upgrading is greatly assisted by completing the related ECI course. In the past 10 years the Extension Course Institute has graduated more than 240,000 students. Enrollments are increasing annually and the end is nowhere in sight.

Reason for the phenomenal growth? A/1C Kenneth G. Finchum, an ECI enrollee, explains it this way: "I have found that ECI, with its layman's language, can clarify what sometimes appears to be the most complex of problems. The method of study allows me to complete each course in the allotted time under the most adverse conditions. Each person should take advantage

of the educational opportunities offered for his profession. The best way I know to do this is through the ECI."

If you are not now taking an ECI course, you should look into the 114 courses offered and see which one is most closely related to the area in which you work. There is nothing to be afraid of. The material presented in the courses is written in a clear, easy-to-understand manner, is accurate and complete.

With ECI, there is no waiting list. Wherever you are, you can begin *right now, today*. You are as close to school as your mailbox. Once you begin, you will find as the 300,000 present enrollees have found, that you enjoy your course. And chances are you will not only complete it, but will want to start another. As your career may thus be advanced, so will the Air Force become more effective, and in turn, the Nation profit from your increased ability and competence.

Airmen in the 34th Air Refueling Squadron at Offutt AFB, Nebr., use ECI for OJT upgrading. Lt. Col. L. E. Gunter, squadron commander, discusses courses with TSgt. R. W. Skinner and A/2C O. R. Rhoads.

Questions and Answers about ECI

Your base education services officer is your principal liaison with ECI. He has the latest information about availability of ECI courses.

Here are some specific questions that are frequently asked of ECI and the answers. The Extension Course Institute is always glad to answer queries, but perhaps you can save time by checking the following to see whether your question is answered.

Q. Can an airman enroll in the Squadron Officer School correspondence course?

A. No. The Squadron Officer School correspondence course provides officers with principles and factual information to help them discharge the duties commensurate with their grades.

Q. May airmen enroll in specialized courses designed for the officers?

A. Yes, provided they meet eligibility requirements and no parallel courses for airmen are available.

Q. I am interested in a specialized course for which I do not meet the eligibility requirements. Can I possibly take the course?

A. Ordinarily no. However, if you are exceptionally well qualified, a waiver may be granted. When you request a waiver, include full justification.

Q. Is it necessary for me to take only courses which pertain to my AFSC, or may I take other courses in which I am interested?

A. You may enroll in courses outside your AFSC provided you meet the eligibility criteria. However, the Extension Course Institute prefers that you have a definite purpose and don't make a "hobby" of ECI courses.

Q. Where may technical aptitude tests be taken to meet eligibility requirements for certain courses?

A. Minimum mechanical aptitude index numbers (Airman Qualifying Examinations) are covered by paragraph 17, AFM 35-8.

Q. Are you permitted to enroll in more than one course at a time?

A. No.

Q. May a civilian employee of the Air Force submit an application direct to the Institute?

A. No. In addition to standard indorsement by the base education services officer or other authorized person, each application by a civilian must be approved by his immediate military supervisor as being pertinent to his present or prospective duties.

Q. If you cancel your enrollment, may you enroll again when you have more time to study?

A. Yes. And you are not subject to any penalty.

Q. When you complete the OCS correspondence course, will you get a commission?

A. No. Completion of the OCS correspondence course does not provide a commission. The military knowledge acquired, however, should increase your chances of selection to attend the resident school.

Q. Does the institute offer counseling service to assist the student in preparing for future military duties or possible civilian employment?

A. No. Your base education services officer, adviser, or training officer is in a much better position to offer this assistance.

Q. How do you address correspondence to the Extension Course Institute?

A. Address your correspondence to the Commandant, ECI, Gunter AFB, Ala. Identify your letters with your name, military grade, service number, address, the course in which you are enrolled, and the subject about which you write.

"Do not act as though you had a thousand years to live."
Marcus Aurelius

RETIREMENT PLANNING CHECKLIST

Not long ago we asked a number of officers and enlisted men past middle age what plans they had for retirement. To our surprise only one man in six had what might be called an organized program.

Like other things in modern life, retirement presents complications, considerations, and problems—unless you plan ahead. Unfortunately, for many people retirement planning is like a visit to the dentist—something to postpone as long as possible and put out of mind until the pain starts. But by then it may require a major operation because the condition has become acute.

Today the USAF has nearly 40,000 people on the retired rolls. In a few years that figure is expected to double. The anticipated increase represents the World War II group of airmen in the "brown-shoe Air Force" completing 20 years of active duty.

The USAF provides a Guide for Retirement for every airman with 14 or more years' service. Although the manual spells out many retirement details, retirement planning is a matter requiring individual consideration. It means not only deciding what you want to do and where you want to live, but preparing yourself financially, emotionally, and socially for the years ahead.

While it is virtually impossible in a short article to answer many of the questions that a prospective retiree might ask, the checklist of questions below may remind you of the important areas to be considered.

One of the first questions is: What kind of life do I want to lead when I retire and what do I want to do? Health, family problems, economic conditions, and the difficulty of obtaining work at your age are factors to be considered. And they pop up sooner than you think after you leave the Air Force.

Do you know what your financial position will be on retirement? Financial difficulties in later life are most often caused by drifting along through the years without a good savings plan. With retirement comes an immediate cut in pay and the end of certain allowances. Your family will no longer be protected by the indemnity portion of the servicemen's and veterans' Survivor Benefits Act (except in certain disability retirement).

Do you have sufficient insurance to adequately protect your family and provide some additional retirement income? Your base personal affairs officer is prepared to offer assistance and advice on all insurance matters. Check with him NOW, not the day before you retire.

Have you thought about where you will live—the place best suited to your health, interests, and pocketbook?

Are you buying a home now in the area where you want to retire and building up some equity in it? With a reduced income the prospect of monthly payments lower than rent, and eventually free rent, is a good reason for considering buying a home.

Are you preparing yourself for a full- or part-time job after retirement? If you don't plan to continue doing the same type of work in civilian life that you do in the Air Force, you should look into the possibility of perhaps turning your hobby into a small business of your own. Many former Air Force personnel are doing this—successfully.

Are you building outside interests that will help make your retired life full, varied, and meaningful?

After you've made the transition from Air Force blue to mufti, there will be the shock of living in an entirely new environment and according to a new pattern. In the service your livelihood, your job, were more or less guaranteed. The Air Force takes care of its own. In an emergency there were always family services, the AF Aid Society, and USAF friends and neighbors in the close-knit Air Force family to lend a hand.

After retirement, it's a new deal, a different world. In the Air Force you were somebody. In civilian life you're just another guy named Bill or Joe.

Some former Air Force personnel have tried to ease the transition impact that goes with the sudden changeover to civilian life by settling in an Air Force community. Orlando, Fla., for example, has so many former Air Force officers living there in retirement, it's popularly known as "Brass Hat Heaven." Sometimes airmen retire near a base where familiar activities, BX, commissary, medical facilities, and Air Force buddies are close by.

These four simple rules may help you in planning your retirement:

1. Have confidence in yourself and your ability to tackle something new.
2. Start thinking about a definite plan. Remember that we prepare ourselves over many years for picking up the tools of our lifework, but we spend little or no time learning to lay them down.
3. Consult your family. Your retirement will affect their lives, too.
4. Take a definite step toward your retirement by discussing your plan now with your Personal Affairs Officer.

It's up to you. The years you spend in retirement can be valuable to you and the community you live in. They can be fruitful, active, productive years. Advance planning today can make them so.—DAVE KARTEN

THE AIR FORCE'S POLAR PUSH

by 1st Lt. Brian T. Sheehan, *Airman Staff*

"USE YOUR ASH TRAY. Keep Greenland Green." This sign, humorous in a country where hardly a living thing grows, is painted red and stands 15 miles from Thule Air Base near the Greenland icecap.

It was discovered last summer by a small group of scientists participating in a program to help the Air Force redevelop its Arctic defenses from Canada to the North Pole and from Alaska to Greenland.

The sign was remembered as the funniest "find" in an otherwise serious program of construction and research projects rooted in a prediction by the late General Henry H. "Hap" Arnold. "If there is another war," the former Air Force chief of staff once said, "its strategic center will be the North Pole."

General Arnold's perceptive statement has rung true down through the years. Air Force strategists today fear a part of America's military threat is from an ICBM attack coming over the North Pole from Communist Arctic missile sites.

To counter this possibility and stay ahead of the communists militarily, the Air Force has conducted an Arctic development program for some time. But more recently a number of special projects were undertaken in the polar regions. They have dramatically altered the Air Force's mission along the great Northern frontier. They include:

★ The building of BMEWS (Ballistic Missile Early Warning System) sites at the Danish-American Defense Area at Thule, Greenland, and Clear, Alaska, to give the U.S. a reliable radar early warning against enemy ICBM attack.

★ Construction of the Rearward Communications System which links BMEWS forward posts to NORAD (North American Air Defense) combat operations center at Colorado Springs, Colo.

★ Building four new radar sites which now extend the Dew line (Distant Early Warning Line) across the Greenland icecap east of Sondrestrom AB, another Danish-American Defense Area, to give the U.S. added protection from manned bomber

attack. Two of these stations will be on the icecap itself.

★ A dramatic search for ice- and snow-free areas in remote polar regions.

These vital programs reveal the Air Force's intention to stay in the North and make America's first line of defense within rock-throwing distance of the North Pole. They show conclusively the Arctic's role in military affairs is growing—not shrinking—day by day. They predict our future polar defenses.

Five years ago when the Air Force surveyed its air defense needs for the coming missile age it realized that by 1960 America would be vulnerable to both enemy-manned bomber and ICBM attacks coming over the polar air routes. To meet the ICBM defense requirement an unbelievably complex electronic warning system, called BMEWS (pronounced bee-mews) was developed to give the U.S. a reliable radar early warning against enemy missile attack.

Before last summer there were no BMEWS sites in the high Arctic to warn America. Earlier a great deal of planning for the future warning system had taken place, and scientists located two possible BMEWS sites. One was on a brown, bare permafrost plateau north of Thule AB, Greenland; the other was 40 miles from Fairbanks, Alaska. Still, no construction work had taken place and the critical time was quickly approaching.

North Star Bay, adjacent to Thule AB, Greenland, was where dozens of freighters brought in vital supplies to support the Air Force's polar push.

BMEWS Foundations

Then a year ago last summer, civilian construction gangs, under supervision of the U.S. Army Corps of Engineers, went into the Arctic north of Thule AB and poured concrete foundations capable of supporting tons of radar tracking equipment.

Over one of the concrete foundations was built the "cow palace," a wood frame building designed to seal out the Arctic winter and give the Air Force an early start on construction the next year. The other pedestals were left in the open, unprotected. When a small advance party of Air Force officers and contractors arrived at Thule last April they discovered the "cow palace" had been crushed by tons of ice and snow. All equipment stored inside was frozen. The other foundations were hidden from sight under the cold, wet snow.

While Arctic temperatures were still below freezing, and bone-chilling winds whipped down from the north, construction crews uncovered the wrecked building and dug for the other foundations. They were shoveled clear, and large rubber tents were inflated over them to keep out the wind and cold. The tents, sporting bold zebra stripes and heated by gasoline burners, gave the Air Force a two-month "jump" on the Arctic weather.

Last summer the frozen Wolstenholme fjord leading to North Star Bay was crashed open by Navy icebreakers July 2 and the first of 16 freighters, loaded with BMEWS materials, steamed into port eight days later. Sweating stevedores unloaded the precious cargo into waiting trucks which hauled it over a rocky, twisting road to the future Air Defense Command site.

Meanwhile, the Air Force BMEWS liaison office set up operations at Thule with a three-man staff, headed by Lt. Col. John D. Crisp, chief of BMEWS eastern field office. Their difficult task: monitoring on-site implacement and installation of communications and electronics equipment by the Radio Corporation of America, the prime BMEWS contractor, and coordination with construction work by the Corps of Engineers.

Their job was so complex that when Colonel Crisp, the on-site supervisor, first saw the BMEWS organization chart he had to read it over and over again to be sure he understood the responsibilities of all participating agencies. "What I finally found out," said the pleasant soft-spoken officer, "was that the BMEWS construction program was primarily an Air Materiel Command project heavily supported by SAC, ARDC, MATS, other commands, the Army and Navy."

Regardless of how many services participated in the BMEWS project everything went smoothly. Air Force experiences gained from building Thule AB in 1951

sheared many problems in half. When Thule was built someone who ordered telephone poles received a terse TWX from higher headquarters telling him to use "local resources." If there is a tree in Northern Greenland it hasn't been found yet. Fortunately, no such headaches plagued this undertaking because a tight-knit research, development, logistical and supply schedule, involving all services, was rigidly adhered to.

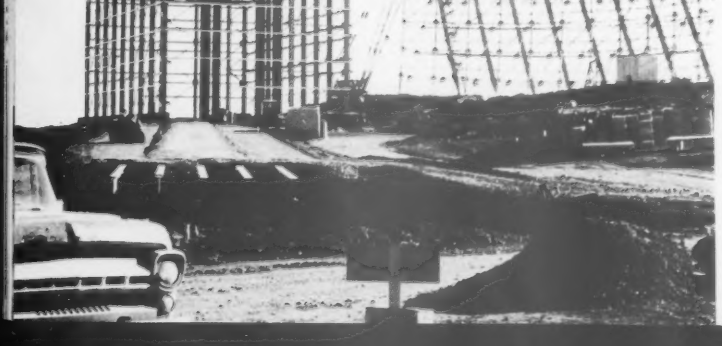
By last June the heavy steel construction work began to take form as the 165-foot high and 400-foot long antennae, situated in a half-mile semicircle, rose skyward and cast shadows where once only Arctic fox had been seen.

Construction workers had few difficulties because research had anticipated the unique problems of Arctic building. Steel beams used in the antennae, for example, were tempered to withstand minus-65 degree temperatures though the lowest temperature ever recorded at Thule was minus 42 degrees. Previous tests had shown that steel not tempered for Arctic weather would split like glass when exposed to subzero weather. Such detailed knowledge permitted construction to race ahead of schedule.

By the end of last summer the buildings which connect the BMEWS radar antennae were almost complete, and the final touches on the heavy construction phase of the project were wrapped up. Then the emphasis changed from heavy construction work to the installation of tons of sensitive electronic equipment that makes BMEWS tick.

Much of BMEWS' delicate electronic equipment was stored in the U. S. until time for actual installation. Last December and January MATS *Globemasters* hauled it to the Air Force's northernmost base. "We had heated vans waiting on the flightline to pick up the electronic systems," said Colonel Crisp. "This was necessary because the slightest temperature fluctuation could have ruined some of the instruments." They were moved in the warm vans to the site without incident.

New giant BMEWs antennae near Thule AB will give U. S. a reliable, 15-minute warning of enemy ballistic missile attack.



While all this was going on BMEWS mess halls, living quarters, and support facilities were completed at Thule so that when the site becomes operational later this year its technicians will have just about the finest living conditions in the North. At Thule, where the men will live when not on duty, they can get a steam bath and play handball, or watch the latest TV news and kinescopes beamed right into their warm quarters from Thule's famous station, KOLD-TV.

Since the men must travel back and forth between the air base and the Ballistic Missile Early Warning Site, a road they travel has been marked with orange-painted oil barrels for their safety. Shelters were recently built every mile along the road for protection, because a man caught in the open by a surprise, 100-knot "phase" wind can freeze to death in 10 minutes.

Target date for completion of the BMEWS project is classified, but when the Thule site is finished it will be linked with Site Number 2 now under construction at Clear, Alaska, and the planned Site Number 3.

Radar Network

How these three electronic giants will work together is a masterpiece of engineering. The massive detection reflectors at each site look across the horizon into the sky above the other half of the northern hemisphere and there pick up "blips" which signify rocket or ICBM firings.

In event of an attack this information would be flashed to high-speed computers which accurately tell the speed, trajectory, and ultimate target areas of the guided missiles. In less time than you can read this sentence the data is further transmitted to the North American Air Defense Command's subterranean combat operations center at Colorado Springs, Colo., where it is quickly evaluated. "Alerts" then go out to SAC, ADC, and civil defense agencies.

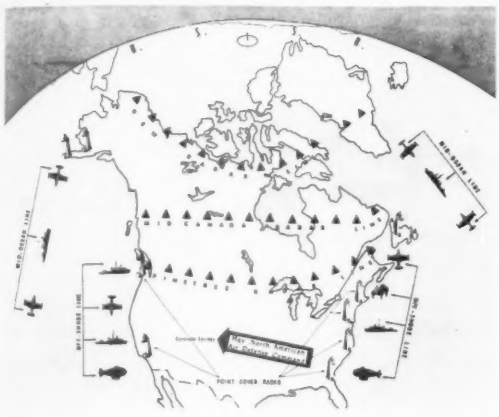
The problem of getting messages from BMEWS forward sites to NORAD's combat operations center, however, is not as simple as it sounds. The messages must be sent rapidly, accurately, and without natural interference. Before last summer there was no communications system to handle this important job. So, while BMEWS site No. 1 was being erected at Thule, the Air Force built a communications network, south from Thule, to handle this part of the warning system. Called the Rearward Communications System, it makes BMEWS "come alive."

Scientists planning this system knew it had to be foolproof, and only a communications system incorporating land cables, submarine cables, line-of-sight stations, and tropospheric scatter radio techniques would work correctly in the Arctic.

Before the Rearward Communications System was developed, violent storms, magnetic disturbances and static often blotted out conventional radio signals in the Arctic. The new multiple communications system

Solidity and thickness of ice in Alaska are studied by scientist from Air Force Cambridge Research Center. Groups of scientists prowled Arctic last summer looking for frozen lakes from which aircraft could take off and land.

Network of Arctic air defense systems are linked to NORAD Hq. at Colorado Springs, Colo. The Air Force has spent millions of dollars redeveloping its polar defenses.



overcomes this problem. One of its best subsystems is the revolutionary Forward Propagation Tropospheric Scatter—a new form of ultra high frequency radio telephone-teletype system proved reliable on the Dew line and the "White Alice" system in Alaska.

It works simply. A huge parabolic antenna throws up a concentrated cone of signal, most of which passes out into space. Some of it deflects downward from the troposphere (all atmosphere below the stratosphere) and there it is "captured" by another carefully sited parabolic antenna. The message is then amplified and fired out on the next leg of its journey. Messages can be beamed 400 miles from antenna to antenna, and the only limit on distance is the number of "tropo" stations. These antennae sprang up on mountain tops in the Arctic at preselected sites at the same time the rest of the communications system was established. When all the systems are completed voice and teletype messages will sing south from Thule in record time. Calling someone at Colorado Springs from Thule will be like dialing your neighbor.

Dew Line Extension

Until last summer the Dew line spread across the Arctic in a 3,000-mile arc from Western Alaska to its anchor point on Baffin Island, Canada. It had six major sectors, each providing radar warning for a 500-mile area. At one-hundred-mile intervals between main sites, auxiliary sites, called "auxes," were manned by 20 radar technicians. Three-man "I" sites filled in the remaining gaps.

This string of sites, built for the Air Force on mountain tops and rugged hillsides at a cost of $600,000,000, was designed to give America warning of bomber attack.

The early-warning line was conceived in 1952 by a group of scientists meeting at the Massachusetts Institute of Technology's Lincoln Laboratory. It was planned, funded, and became part of the joint American-Canadian air defense system in July 1957.

However, the long, snaking Dew line was not really complete because its eastern flank, between Baffin Island and Greenland's east coast, stood unprotected. It was a perfect place for enemy bombers to slip past radar picket ships and thunder down on a sleeping, unsuspecting America.

But to extend the Dew line further east meant that two of the new radar sites would have to be built on the Greenland ice cap where man had never before permanently lived. Two other stations were sited on mountain peaks along Greenland's jagged, narrow coastline.

Before the Air Force dared venture onto the forbidden ice cap last summer to establish two new radar

Ships' captains threaded their way past thousands of deadly icebergs to get valuable cargoes to Thule.

sites (officially called "Dye Sites Two and Three") it made an intensive study of the frozen icecake which extends almost 1,700 miles from north to south and covers eight-tenths of Greenland.

It learned the icecap is nearly 10,000 feet deep, and that it is all solid ice except for the top 60 feet which is made up of layers of dry, powdery, crusty snow. It discovered that if the icecap were to melt, it would raise the water level of all the world's oceans by 30 feet.

The Air Force made a thorough snow study. Its conclusions: building even a small hut on the icecap posed tremendous problems and hazards.

But the two radar sites had to be built. So survey teams invaded the cap and located the two areas which looked most feasible. They were located eastward of Sondrestrom AB, a small, strategic Air Force base on Greenland's west coast.

Airlift Mission

The nearly impossible mission of flying every piece of equipment, from the heaviest steel beam to the lightest nut and bolt, along with construction workers, to the two stations was accomplished by Tactical Air Command's 61st Troop Carrier Sq., Sewart AFB, Tenn.

Last April five ski-equipped C-130s began making the supply runs to the two future Dew line sites. Seven more C-130s joined the operation by the month's end.

Before the airlift—blandly called mission number 5603 by TAC—had begun, there were only three small "Jamesway" huts on the icecap. They were buried under snow drifts. But the Air Force dragged two 6,000-foot long and 200-foot wide landing strips at each site near the huts. One strip was oriented in the prevailing wind direction; the other perpendicular to it. This gave C-130 pilots optimum landing conditions, regardless of wind direction. Cerise panels mounted on bamboo poles served as runway markers.

The daily flying operations to the two "dye" sites were hazardous. "Whiteouts"—where the sky and white snow blend into infinity—forced pilots to fly instruments 90 percent of the time. Despite all safety precautions, two *Hercules* aircraft crashed on the icecap before the operation was over. Miraculously, no lives were lost.

Weather on the icecap changed almost hourly as airmen flew an average of 12 missions a day out of Sondrestrom AB. One minute the icecap snow would be hard as rock, perfect for safe ski-landings. A half-hour later it could be wet, dangerous slush. Other weather problems made flying even more dangerous. Cargo pilots discovered that during "final approaches" over the new sites cold air coming off the icecap would make their aircraft "flare out" too early. They learned never to relax their grip on the controls.

In less than eight weeks after the mission began the two radar sites took shape. They first looked like the burned-out steel structures left standing after the atomic bomb blast on Hiroshima during WW II. This was before laborers, earning $1,000 a month, put on the aluminum siding. Between April 1 and November 1, 1959, the 61st Troop Carrier Sq. airlifted more than 2,500 construction workers and some 28 million pounds of cargo to the icecap sites.

Now the two radar sites are almost ready for operation. Their job will be like the job of their predecessors in Canada and Alaska. Soon they will plug the last hole in the Dew line, and relieve radar picket ships and radar-equipped (AEW) aircraft from patrolling this vital defense area.

Scientific Studies

Meanwhile, other recent Arctic projects promise to divulge the nature of the Air Force's future polar defenses. They differ considerably from the construction programs that made BMEWS, BMEWS Rearward Communications, and Dew line realities, because they concern research.

A group of scientists from the Terrestrial Sciences Laboratory of the Air Force's Cambridge, Mass., Research Center recently conducted Arctic studies so important their program objectives had to be clouded in the strained, difficult language of scientific research.

Their objectives, according to an Arctic Terrestrial Research manual, were to "identify, investigate, map, describe, test, and evaluate snow, ice and natural land areas in the Arctic to determine their capabilities for supporting air activities." What this means in simple English is that the Air Force is searching for new ways to use the Arctic's strategic and defensive capabilities.

C-130s from Sewart AFB, Tenn., flew men and equipment from Sondrestrom AB to two new radar sites constructed on the Greenland icecap. Pilots and aircrewmen attended Arctic survival school at Harmon AB, Newfoundland.

Last summer a number of Terrestrial Science Laboratory scientists, directed by Col. Louis De Goes, hurried into the Arctic's short summer and headed for remote areas along Greenland's eastern and northern coastlines, to Ellesmere Island in Northern Canada, and Northeast Alaska.

From Thule AB, Greenland, a program labeled "project 76282-B," under supervision of Mr. Francis Crowley, was begun last May when nine people and 45,000 pounds of cargo were airlifted from Laurence G. Hanscom Field, Mass., to Thule AB in C-130 and KC-135 transports. This research program, undertaken with the cooperation of the Danish Government, was divided into summer and fall phases.

The summer phase began in mid-May when an advance party of four scientists with 6,000 pounds of equipment were flown from Thule to the Ellesmere ice shelf near Ward Hunt Island in Northern Canada. The group was later joined by four other research experts. They stayed on Ellesmere until the middle of September, and proved, after studying the composition, heat budget, and wasteage of the area, that runways could be built in summer at little cost and effort.

Last September the fall program got underway, when a group of AFCRC scientists replaced the original party on Ellesmere Island and examined the area to determine if artificial ice runways could be built there in the winter. They flooded flat, permafrost areas and sprinkled water on prepared airstrips. Chill winter temperatures froze the areas into hard-as-concrete runways. The scientists departed their isolated camp in November just before winter threw its four-month blanket of darkness across the windswept, barren area.

From May to September another research program supervised by Cambridge scientist Stan Needleman was staged out of Thule. Task 76284 had two parts: "Ground Hog I" and "Ground Hog II."

"Ground Hog I" took place in the Polaris Promontory area of northern Greenland. Its objective: to finish an emergency landing strip started there in 1958; conduct an intensive geological and soil engineering survey of an alternate airstrip located approximately 15 miles west of this main site. Both objectives were successful and on August 15 a C-130 touched down for the first time in that part of the Arctic.

Meanwhile "Ground Hog II" was also underway at Centrum Lake near Nord, on Greenland's east coast where a group of scientists prepared a runway where either a KC-97 or C-130 was scheduled to land that summer. Their second objective was to locate potential airfield sites nearby and identify access routes to the Greenland icecap.

To support this operation a four-man airdrop team, flown from Pope AFB, N. C., to Thule, airdropped 200 barrels of petroleum, 120 cases of rations, and other

Courageous aircrew landed ski-equipped C-130 in Nord area of Northern Greenland to prove such operations were practical and safe. Temperature on ground was minus 20 degrees.

supplies at eight cache points in the Nord area.

These resupply areas were used by the Cambridge scientists when they surveyed the area and prepared the airfield, before their operations were completed.

Almost a continent away, in Alaska, much the same Arctic Air Force research program was taking place. Two scientific teams prowled the Alaskan wilds in search of new Arctic secrets. They weren't disappointed. In northeast Alaska a small band of scientists, headed by Dr. G. William Holmes, studied the thaw-to-freezeup of the Arctic, with an eye toward future air operations. Their experimental center was at Lake Peters where they tested the thickness and solidity of ice during different months. The results of their studies showed that large aircraft could successfully land and take off from frozen Arctic lakes.

Not far from this expedition, a two-man team, supervised by Charles R. Lewis of the U. S. Coast and Geodetic Survey, mapped and charted areas where few men had ever been. They were searching for ice- and snow-free areas which had earlier been identified by Air Force photo reconnaissance aircraft.

Arctic Future

Discoveries from terrestial studies in Alaska, and in the other polar regions, may foretell the high Arctic's military future. The Cambridge scientists recently located 40 ice- and snow-free areas where they believe inexpensive air bases, deployment airstrips, and guided missile sites could be built.

They point out how easy it is to build defensive installations in the Alaskan Arctic. "The annual rainfall in certain parts of Northeast Alaska is less than at Death Valley, Calif.," said one scientist, "and the permafrost there stays rockhard the year around. This would sure beat building bases in the banana-belt latitudes near the Dew line where you have all kinds of foundation problems in construction.

"Erecting new airfields and guided missile sites at the ice- and snow-free areas would be inexpensive because real estate there is cheap," he added. "There wouldn't be any diplomatic problems because Alaska is now a state."

A large variety of weapon systems could be successfully employed in Alaska. Long-range B-47 jet bombers and missile-launching B-52s could operate off the larger ice- and snow-free areas or from frozen lakes during winter. IRBM sites could be built in Alaska, and they would cover a number of Communist ICBM sites in northern Soviet and Siberia.

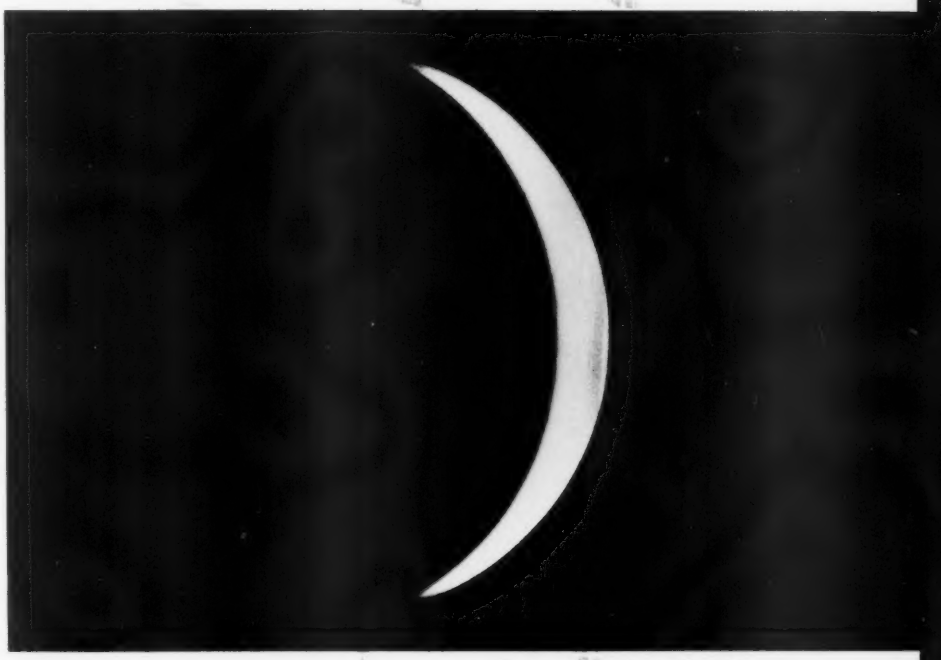
Supersonic fighter-bombers, capable of packing nuclear weapons, could be "zero-launched" from small, dispersed steel platforms situated along the great Northern frontier. In a moment's notice they could be airborne with JATO assist, make their quick-as-a-flash bomb runs and return to landing strips built on the ice. It is not impossible that anti-ICBM weapons could be placed in the same area.

From such futuristic thinking it isn't difficult to see why the Air Force is taking a long, penetrating look at the Arctic.

The Air Force, of course, hasn't talked much about its future Arctic plans. Information necessary for a complete appraisal of Alaska's military potential, for example, is still being compiled and evaluated. But when all the facts are in some new construction projects may result.

A number of the Air Force's Arctic experts—the Cambridge scientists—want action right now. One of them puts it this way: "The Communists have been sprinting with their Arctic projects while we've been sleeping. But this is one race we can't afford to lose. If we do, we may be crawling—at bayonet point—the rest of our lives."

RUNDOWN FOR VENUS



A BURNISHED CRESCENT *in the heavens is the appearance Venus presents when moving toward or away from the orbital arc of its closest approach to Earth. That this most beautiful of all planets passes through phases just like the Moon was discovered in 1610 by Galileo, using the newly invented telescope. His observations provided the first scientific proof the Earth could not be the center of the universe, as men then erroneously believed. The 200-inch Hale Telescope at Palomar made this photograph in blue light.*

Photo courtesy Palomar Observatory

Pioneer V is expected to be within 7.5 million miles of the orbital environment of Venus by mid-August. Here are some facts about the planet.

Mean Diameter: 7,700 miles vs. Earth's 7,920 miles.

Distance from Earth: Minimum, 24.6 million miles; Maximum, 162 million miles; Mean, 93 million miles.

Mean Orbital Velocity: 78,300 miles per hour vs. Earth's 66,600 m.p.h.

Axial Rotation: 22 hours, 17 minutes* vs. Earth's 24 hours.

Revolution in Orbit: 224.7 days vs. 365.265 days for Earth.

Composition: Undetermined.

Color: Unknown; the planet is perpetually shrouded in a dense atmospheric envelope which makes visual observation of the surface and its topography impossible.

Temperature Range: Top of atmosphere, −38 to +122 degrees F; somewhere in atmosphere, +54 to +117 degrees F; surface (measurement by radio telescope) +60.3 to +405 degrees F.

Atmosphere: Mostly carbon dioxide, probably with small amount of other gases. The planet's opaque atmospheric envelope is yellowish white and reflects more than half of the sunlight received. The albedo (percentage of light reflected) is 0.59 vs. Earth's estimated 0.29.

Surface Area: 186,265,464 square miles vs. Earth's 196,950,284 square miles.

Total Volume: 0.92
Mass: 0.81
Density: 0.89
Surface Gravity: 0.85
} Earth=1.

Escape Velocity: 6.3 miles per second vs. Earth's 6.96 m.p.s.

Possibilities of Life: Unlikely, in the opinion of most scientists, except perhaps for some very primitive organisms which, given favorable evolutionary conditions, might conceivably develop into more advanced living forms.

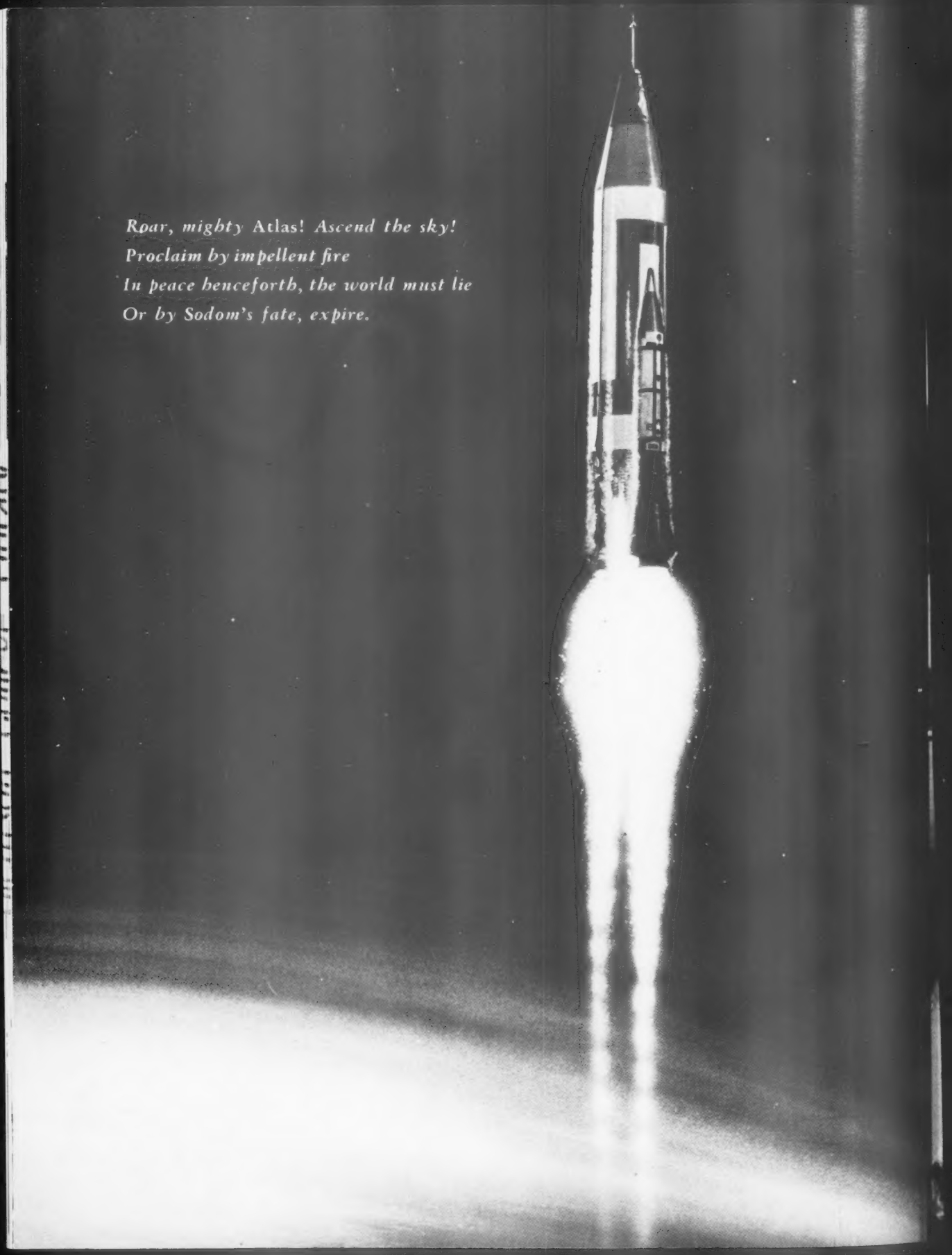
Eccentricity of Orbit (i.e. deviation from circular): 0.0068 vs. Earth's 0.0167.

Inclination to the Ecliptic (or Earth's Orbital Plane): 3 degrees, 24 minutes.

Inclination of Equator to Orbital Plane: 25.5 degrees vs. Earth's 23.5 degrees.

—WILLIAM A. KINNEY

*Because the planet's thick atmosphere hides its surface, astronomers have been handicapped in their efforts to establish the rotation period. The figures given represent the latest estimates. In the past, computations have ranged from 20 hours to 225 days, the latter being about the same as the time required for one orbital revolution, or a Venus "year."


Roar, mighty Atlas! *Ascend the sky!*
Proclaim by impellent fire
In peace henceforth, the world must lie
Or by Sodom's fate, expire.